BIG MOTORSHIP WITH DIESEL ENGINES AND REDUCTION-GEARS

NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Vessels

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EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

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PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction.

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First of the Hamburg-American Line's New Fleet of Motorships

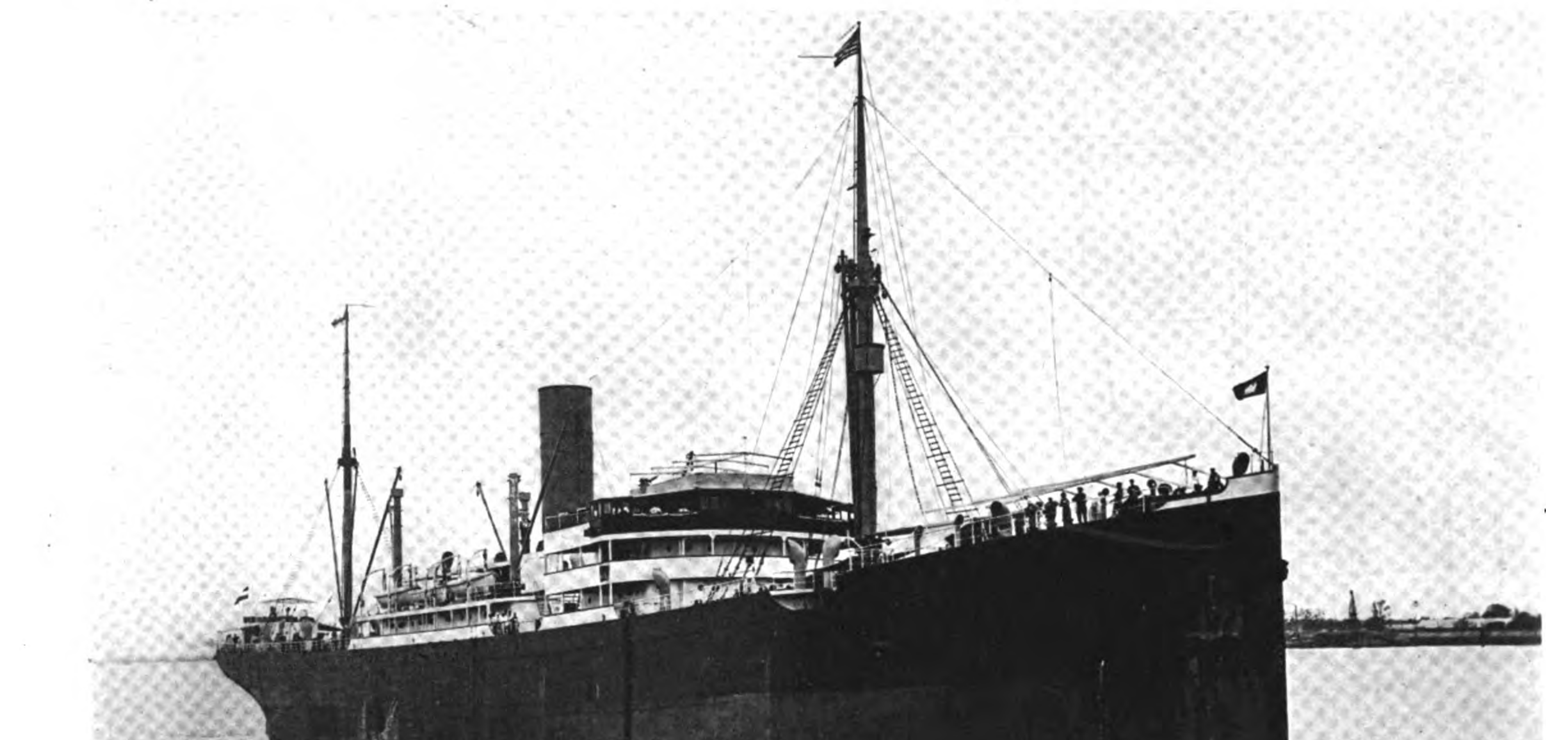
"Havelland," a 10,235 tons Deadweight Freighter with High-Powered Submarine Diesel-Engines and Reduction-Gears. Total of Ten Motorships Now Building For This Prominent German Shipping Concern—Eight to Have Double-Acting and Single-Acting Direct-Drive Two-Cycle Engines

BEING such a distinct innovation the Hamburg-American Line's new motorship "Havelland" will be closely watched in operation, and if the next year's performance is as successful as her maiden voyage from Hamburg to New Orleans, La., wholesale conversion of German steamships to motor-power may be expected, because the costs of power plants similar to that in the "Havelland" will be down to a low figure, due to the numerous high-speed Diesel-engines being available at low cost, and because of the very small engine-room necessary.

This vessel is propelled by twin high-powered four-cycle type submarine Diesel-engines driving slow-turning propellers through reduction gears. The original power of the engines was 3,000 shaft h.p. each at 390 R. P. M., on a weight of 15 tons but their running speed has been reduced to 230 revolutions. As the reduction-gear has a ratio of 1 to 2.7 the propeller speed is 85 per minute. At the speed in question the main engines now together develop 3,300 shaft h.p. or nearly 4,500 i.h.p., the piston-speed being 798 ft, per minute. Each engine, it will be remembered from the exclusive description published in "Motorship" of January, 1920 on pages 25 to 28, has ten cylinders 530 mm (20.866 in.) bore by a stroke of the same dimensions. For reliability and durability, the mean indicated-pressure has been reduced from 117.8 to 102.2 lbs. per sq. inch. As the overall length is only 37 ft., 5 in. it means that the length of the entire machinery space of this vessel obviously could be reduced from its 22 meters, but we understand that all the space that could be gained was not worth taking full advantage of under the German registration rules. By suitably proportioning the engine-room, an additional space of 18,000 cub. feet can be gained. However, compared with a sister motorship with direct Diesel-drive ,there is a saving of 330 tons in machinery weight, and a gain of 6,000 cubic feet, while the saving compared with a steamship is much greater. The machinery of the "Havelland" including reduction-gears weighs only 250 tons.

As we have very fully described and illustrated these engines we will not re-describe them now. But we recall that we urged the Shipping Board at that time to test-out the duplicate pair of engines (shipped to the U. S. by Capt. E. C. Tobey then head of the Fleet Corporation in London) in conjunction with electric-drive or reduction-gears, but it was left to German engineers and shipowners to be sufficiently enterprising to undertake this work. America's uneconomical steamers will be obliged to compete against them.

While several American Diesel-engined motorships have been placed in service with reduction-gears, including the "James Timpson" and the "Libby Maine," the power per engine did not in any case exceed 500 shaft h.p., so a single step from 500 to 1650 shaft h.p. per engine is quite a jump. The reduction-gears on the Ameri-

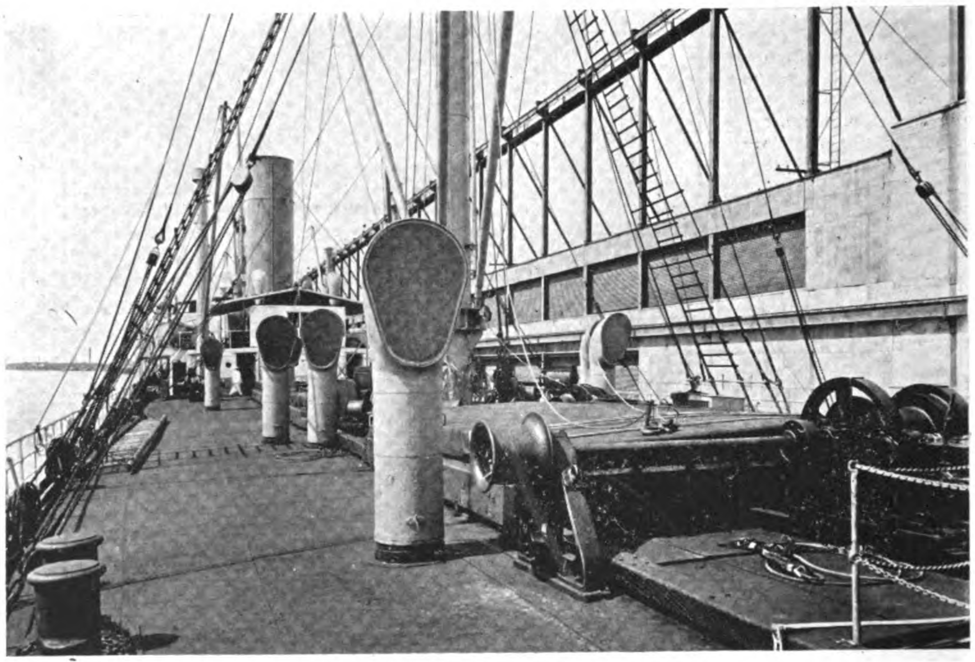


"HAVELLAND," first of the Hamburg-American Line's new fleet of motorships. She is propelled by twin high-powered submarine Diesel-engines operating the propellers through reduction-gearing. She averaged 11-12 knots from Germany to the U. S. A.

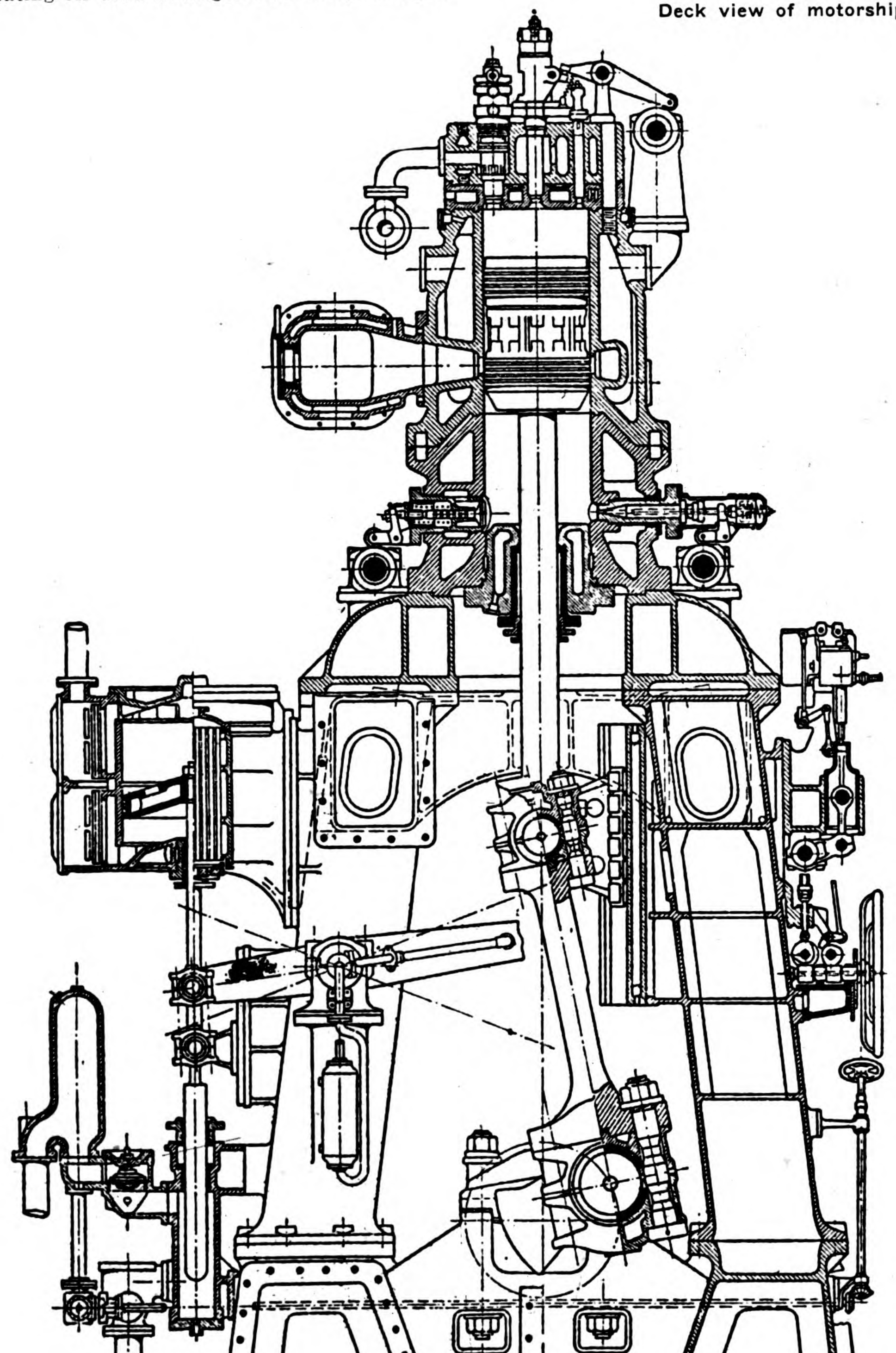
can ships were made by the Falk Co. of Milwaukee, who have made a special study of the same, while the big reduction-gears in the "Havelland" were made by Blohm and Voss.

The sister ship to the "Havelland" is the "Munsterland." Blohm & Voss also have an order for eight additional motorships from the Hamburg-American Line, of which several may have double-acting Diesel engines. We give for comparison with the "Havelland" a sectional drawing of the engine-room of the "Westerland," which is one of the Diesel direct-drive two-cycle vessels now building by Blohm & Voss.

Trials of the "Havelland" were run on Sept. 10th, 1921, and after maintaining an average speed of 11.12 knots, she reached New Orleans on her maiden trip from Hamburg on the afternoon of Saturday, Oct. 1st, 1921. The "Havelland" sailed from Hamburg within a few minutes of midnight, September 10th (European time.) Her engine-room record showed her engines together developed an average of 3,603 i.h.p. on a mean fuel-consumption of 136 grams per indicated horsepower-hour, or 0.299 lb. From this, we presume, at least 5% must be deducted for the loss of power in the reduction-gears. The lubricating-oil used averaged 105 kilograms per 24 hours, but her engineer believed that this high consumption was due to some reason which would be corrected very shortly and the amount accordingly reduced.



Deck view of motorship "HAVELLAND," showing electric winches



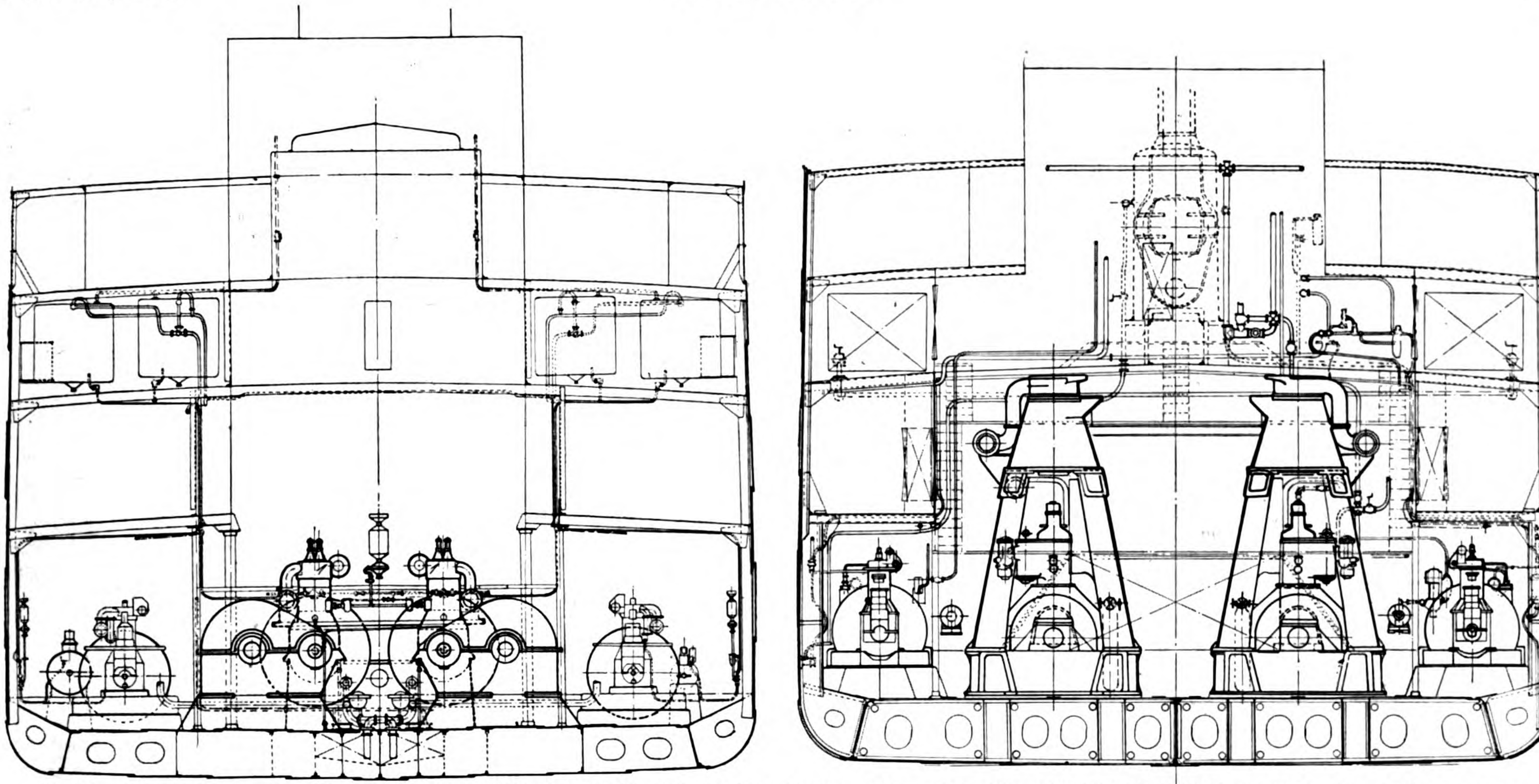
The Blohm & Voss-Nurnberg (M. A. N.) 850 shaft h.p. double-acting two-cycle Diesel-engine of the motorship "Fritz." This engine was fully described on page 301 of our issue of April, 1920

The "Havelland" was commanded by Captain E. Deinat, while the engine-room was in charge of Arthur Hampe. An attache of the engineering-staff of Blohm and Voss, Hamburg, was also on board in the person of Gerhard Stege, consulting-engineer. Herr Hampe and Herr Stege showed the greatest consideration to the representative of "Motorship," although they could only consent to one general photographic view being taken of the engine-room. Herr Stege, however, had prepared a detailed statement explaining the construction of the engines and their operations, and also brought over especially for "Motorship" a cross-section drawing of the engine-room of the "Havelland," and of a sister motorship now building at Hamburg, which will have cross head-type Blohm & Voss Diesel-engines directly connected to the propeller-shafts.

Before proceeding further with the description of the machinery we will give her leading dimensions—

Displacement (loaded S.W.)	14,700 tons
Displacement (light S.W.)	4,600 tons
Deadweight capacity	10,235 tons
Net-cargo capacity on 26,000 miles voyage	8,335 tons
Fuel-capacity (double bottoms)	1,400 tons
Fresh water	200 tons
Cruising radius	90 days at 12-knots or 26,000 miles
Speed (loaded)	12 knots
Speed on maiden voyage (partially loaded)	11.12 knots
Trial speed	12.4 knots
Cubic capacity of holds	10,846 cu. meters
Power (indicated)	4,500 h.p.
Power (shaft)	3,300 h.p.
Propellers (twin)	3.6 meters dia. by 4.7 meters pitch
Daily fuel-consumption	16 tons
Daily lubr.-oil consumption	700 kgr.
Brake h.p. hour fuel-consumption	0.299 lb.
Weight of machinery	250 tons
Length of ship (O.A.)	465 ft.
Length of ship (B.P.)	450 ft.
Breadth (M.D.)	58 ft.
Depth (M.D.)	29 ft. 6½ in.
Draught (mean)	25 ft. 1 in.
Type of auxiliaries	electric
Classification	German Lloyd A1
Gross tonnage	6,308 tons
Net tonnage	3,829 tons
Passenger accommodation	12 first class

Both Herren Hampe and Stege, as well as Captain Deinat, pointed out that the results of the voyage as shown by the engine-room records were most satisfactory, particularly in view of the comparatively light draft resulting from the small cargo aboard. Altogether, the cargo, fuel and ballast hardly exceeded 3,000 tons, whereas the net-cargo capacity of the ship when carrying fuel stores and water for a transatlantic round-voyage is over 9,000 tons apart from the said fuel, water and stores. Consequently her propellers were always less than half submerged, and it is believed she would have developed better speed with a larger cargo. She loaded much more than her



Section at engine-room of the motorship "HAVELLAND" and section of the sister motorship "WESTERLAND," showing size and space of machinery of the same power. Both vessels are being built by Blohm & Voss for The Hamburg American Line. One has high-speed 4-cycle Diesel-engines with reduction-gears, and the other slow-speed direct-driven 2-cycle engines

first cargo at New Orleans and was scheduled to stop at Savannah, and her engineers were confident that her speed would show up much better on this journey as well as on the way over the Atlantic on the return. Her economy is enabling her to carry away American products while American steamers are idle. When carrying fuel for a 26,000 miles voyage, she will carry 8,335 tons of cargo in addition.

Her engineers stated that no trouble whatever was experienced on the voyage over. They reported encountering rough weather during the first several days out but ideal condition on the mid-Atlantic and toward this side.

The view of the engine-room which we reproduce shows the cylinder-heads of the two engines and the control-bridge from which they and the auxiliaries are operated. The transmission gearing is located immediately below the point from which the picture was taken, but consent to a view could not be obtained. As a matter of fact such a photograph would have showed little of the construction features as the gearing on both engines is encased with a steel covering.

The ship is of the well-deck type with long poop and forecastle; she has two continuous steel-decks and is built to the highest class of the Germanic Lloyd. There are 8 water-tight bulkheads extending to the main deck. Accommodations are provided for 12 passengers.

Her two main engines were built during the war at the Augsburg Works of the Maschinenfabrik Augsburg-Nurnberg, for submarine-cruisers. The firm of Blohn & Voss is licensed by this firm to build these engines and has already built some, of which two have been in use in its power plant for several years. In design and construction they represent the highest degree of development of the high-speed, four-stroke cycle oil-engine. as was indicated when we described them nearly two years ago. Six re-designed engines are now being built by the U. S. Navy Yard, at Brooklyn, N. Y., and the New London Ship & Engine Co., Groton, Conn., have a license to construct engines to the M. A. N. design. The operating platform is located in front of and between the engines and is about 5 ft. 7 in. above the floor. All levers, etc., for starting and reversing are consolidated here.

The important question of perfect operation of reduction-gears between engine and propeller was thoroughly investigated on the test-stand, using gears of actual size. In this connection, it became necessary to offset the negative turning moments, which occur with oil-engines and are especially great in the neighborhood of the critical speed, in order to prevent excessive wear of the gear teeth. This end has been attained in the installation in question, not by the addition of separate and often unreliable elements, but by proper proportioning of the transmission shafting and a suitable distribution of revolving masses or balance weights.

During the trial trip, by means of special apparatus, the twisting moments in the shaft, fore and aft of the reduction-gears, were measured photographically; this measurement revealed a uniformity of twisting moment in the shaft on a par with that of a turbine installation.

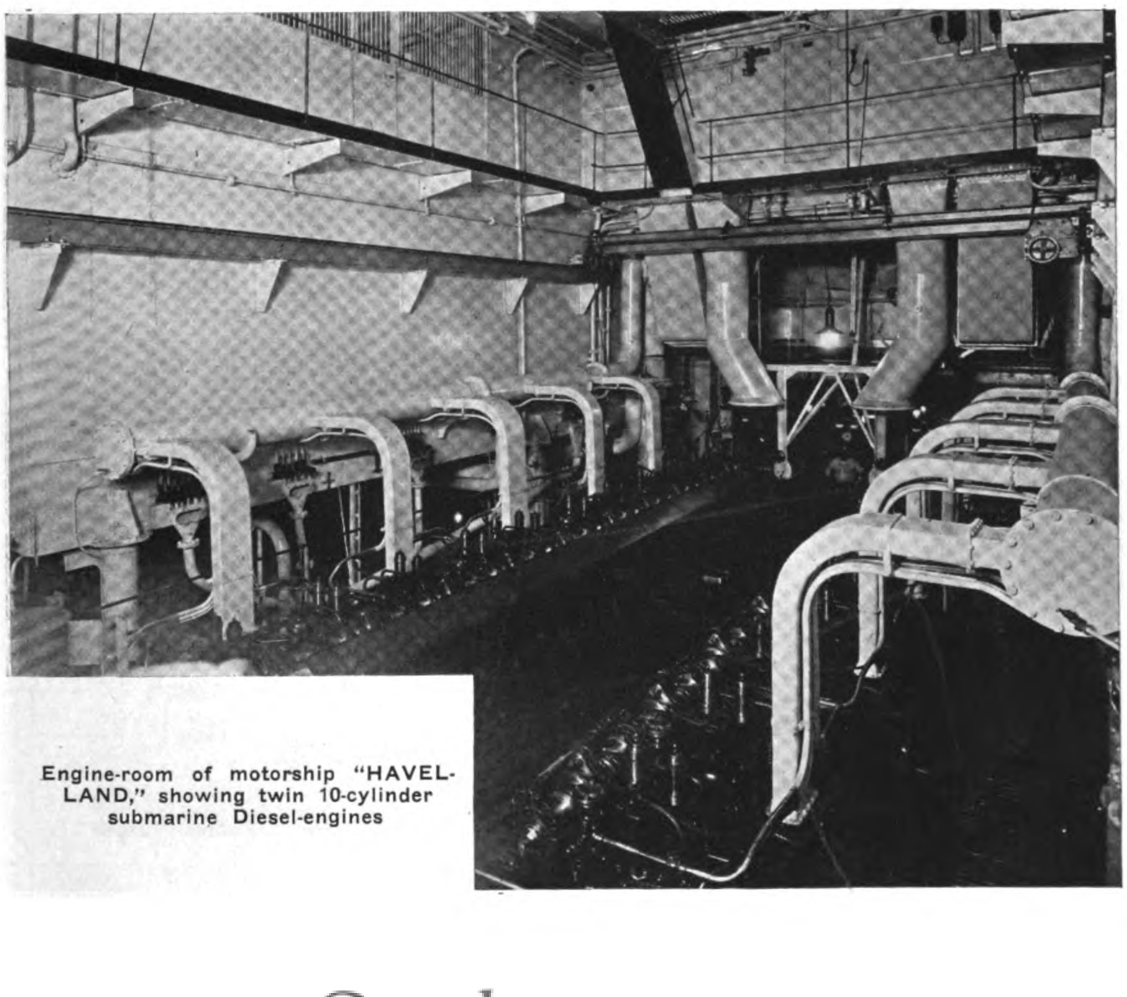
All auxiliary machinery, including the steering-engine and the thirteen cargo-winches, are electrically driven. Two 3-cylinder oil-engines developing 180 h.p. each and coupled to 95 k.w. dynamos are provided; the voltage is 220. In addition, each engine is connected through a clutch coupling to a compressor, intended for furnishing starting-air during prolonged maneuvering. Under ordinary circumstances, the compressors directly connected to the main engines are sufficient to supply the starting-air. The starting-air is stored in eight containers having a combined capacity of 226 cu. ft., under a pressure of 880 lbs.

A small compressor driven by a hot-ball surface-ignition motor of about 5 h.p. is provided for the initial filling of the tanks for the auxiliary engines. The lighting circuit has a voltage of 110 and the power therefore is generated by an 11 k.w. dynamo driven by a hot-ball motor.

The following are also provided:

2 main cooling-water pumps.
2 cooling-water discharge pumps.
1 auxiliary cooling-water pump.
1 oil-receiving and ballast pump.
1 fuel-oil pump.
2 lubricating-oil-pumps.
2 fire-pumps.

During the voyage and in cold weather, the engine-room, tunnel, and also the quarters are heated by hot air, utilizing the exhaust-gases.

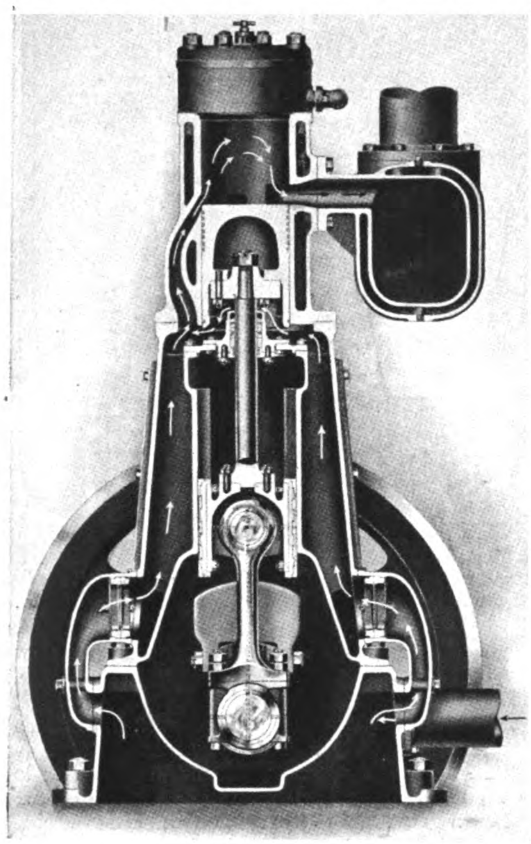


Engine-room of motorship "HAVELLAND," showing twin 10-cylinder submarine Diesel-engines

Worthington Airless-Injection Oil-Engine

First Details of a New Marine Motor For Small Commercial Vessels Developed at the Blake Works, East Cambridge—Successful Tests Run on Regular Steam-Boiler Fuel Oil with Low-Consumption Results

WHILE the Worthington Pump and Machinery Corp. of New York, were engaged in developing the big 2,400 h.p. merchant-marine Diesel-engine at their Buffalo plant, which engine we described in June 1920, the engineering-staff at their works in East Cambridge, Mass. were carefully studying the almost equally difficult problems coetaneous with the design and production of a marine oil-engine particularly suited to the different conditions of small commercial-craft, as well as for adoption with electric generating-sets. In both the latter cases, the first cost must be the lowest possible, consistent with good workmanship and reliable operation. Because, in engines of moderate power a few additional dollars to the overall cost of the engine may mean the loss of sales, as many fishermen and other work-boat owners often pay too close attention to the saving of a dollar or two on the first cost with the result that they are sometimes soon faced with a bigger burden on upkeep charges. While this viewpoint of fishermen may not be wise from a business aspect, it nevertheless exists and unfortunately has to be recognized by engine-builders catering to their requirements.



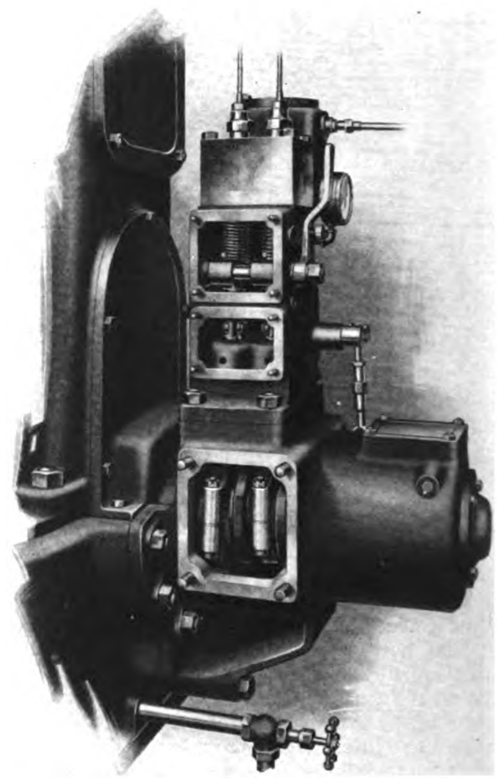
Cross section of Worthington engine, showing scavenging-air system

Therefore, in constructing an engine for the work-boat field, the Worthington designers were faced with the problem of producing an engine better than others already in use, but at a price that could enter open competition where an exceptionally high-grade engine is desired, such as a Diesel-engine, especially where common cheap fuel-oils available anywhere must be used, and which would withstand the hard usage generally met aboard craft of this type in the hands of untrained labor.

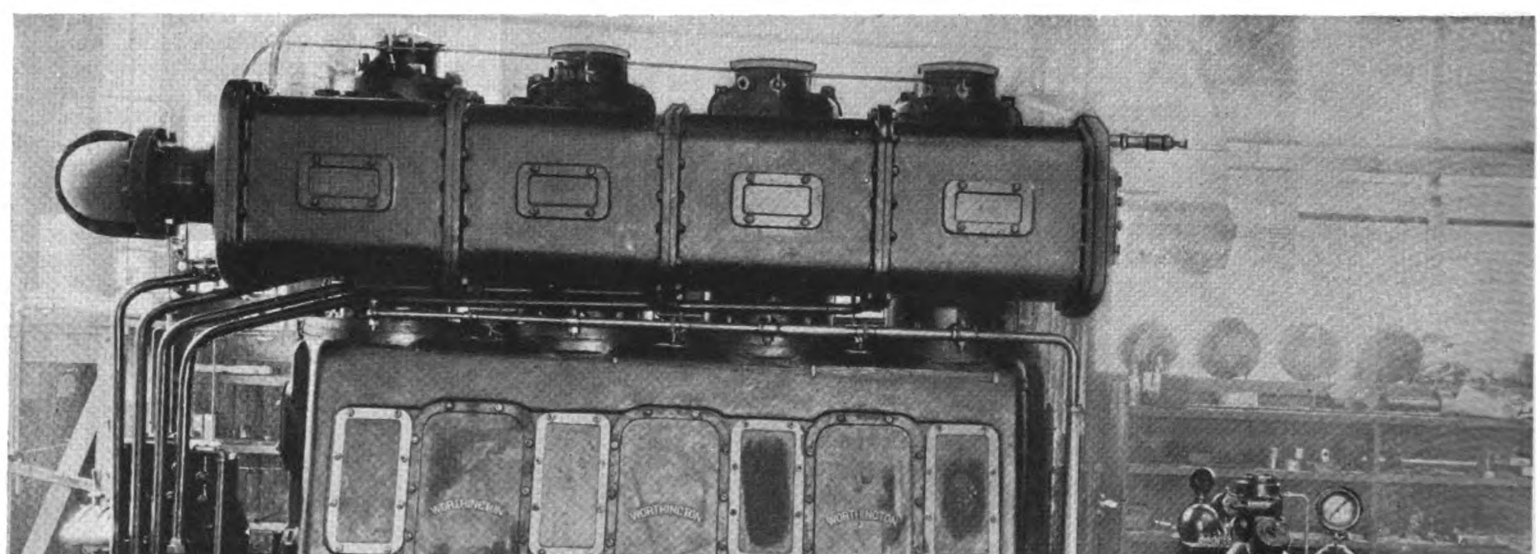
Obviously the answer was simplicty of design and operation, so while the economy of the Diesel cycle was highly desirable, they desired to avoid its complications, as the conditions are totally different from those existing aboard merchant-ships where skilled labor is nearly always available. Nor did they wish to adopt the surface-ignition principal, because they considered that this has been demonstrated to be a factor against the use of the heaviest fuel-oils in non-expert hands. Therefore, they hit upon a compromise, but which was not satisfactory until several years had been spent testing and experimenting and otherwise "ironing-out-the-kinks" in the design, some of which we were told about when recently visiting the Blake works at East Cambridge.

In fact we have an inkling that the task was even harder than they anticipated, in which case it is to the credit of the engineering-staff for persistence, as well as admirable of the executives in New York for their encouragement and consistent backing. For the result is an engine with which they can be highly pleased, and one which will take its proper place in the marine industry. There is a rapidly growing market for a marine-power plant of this character, and in developing along these lines the Worthington Co., together with this big slow-speed Diesel-engine, cover the entire commercial-marine field.

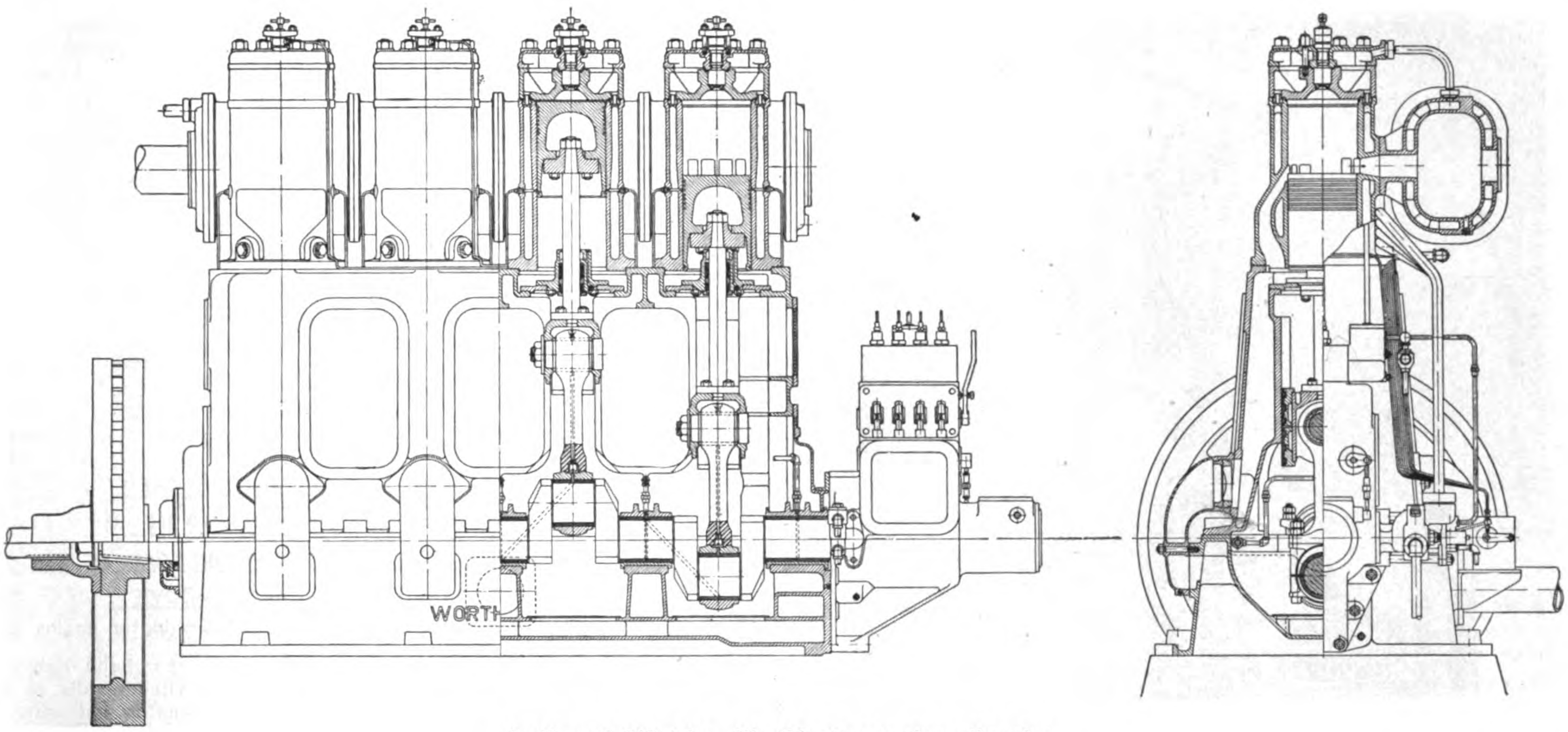
It will be noted that we have employed the term "airless injection" in connection with the new design, in order to denote that no compressed-air is used to blast-in the fuel. So many terms are being used today for high cylinder-compression engines, including solid-injection, mechanical-injection and pump-injection, few of which properly denote the principal, so we have adopted the expression "airless-injection"' as best indicating its difference from the air-blast injection of the Diesel-engine. It is probable that we will standardize this term for use hereafter unless a better one is suggested.



Fuel pump and governor of Worthington engine



General view of the new Worthington airless-injection marine oil-engine



Section of 240 b.h.p. Worthington marine oil-engine

Opinions of engine-builders on this point are welcomed. We trust that designers will thoroughly discuss the matter in our columns.

With the new Worthington engine, which is of the valveless two-cycle type, fuel-oil is pumped to the engine by an attached service-pump, operated by an eccentric on the crank-shaft. This pump draws oil from the storage-tank and delivers it to a small reservoir attached to the fuel-injection pump on the engine. An overflow pipe from this reservoir returns to the storage-tank the excess oil handled by the service pump. In cases where the location of the storage-tank is such as to afford a gravity flow from the tank to the reservoir at the fuel-injection pump, the service-pump may be disconnected and left inoperative, but attention is here called to the Fire Underwriters objections to tanks so located. No starting-coil, fuse, torch or other auxiliary starting device is needed to start the engine, combustion taking place as will presently be described. Certain features of its design are quite different from the conventional engine of the valveless two-cycle type. Ordinarily, surface-ignition oil-engines in low powers are of the trunk-piston type, using the crank-case as a scavenging-air compression chamber. The Worthington engine, however, is of the crosshead type, with a separate compartment between the cylinder and the crank-case for scavenging-air. By such an arrangement, cylinder wear is reduced to a minimum, and it is possible to use a force-feed lubrication system which eliminates lubrication troubles and reduces lubrication cost to a small fraction of the prevailing figure for crank-case compression engines.

PERFORMANCE ON TEST.

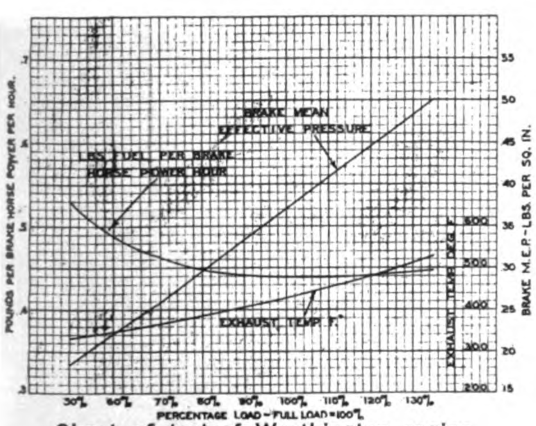
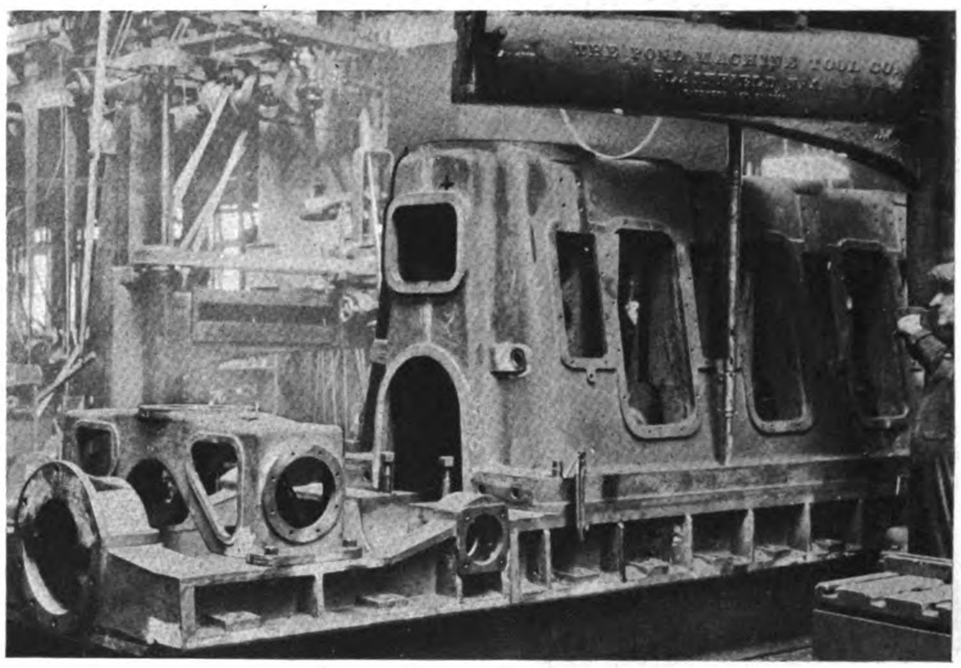


Chart of test of Worthington engine

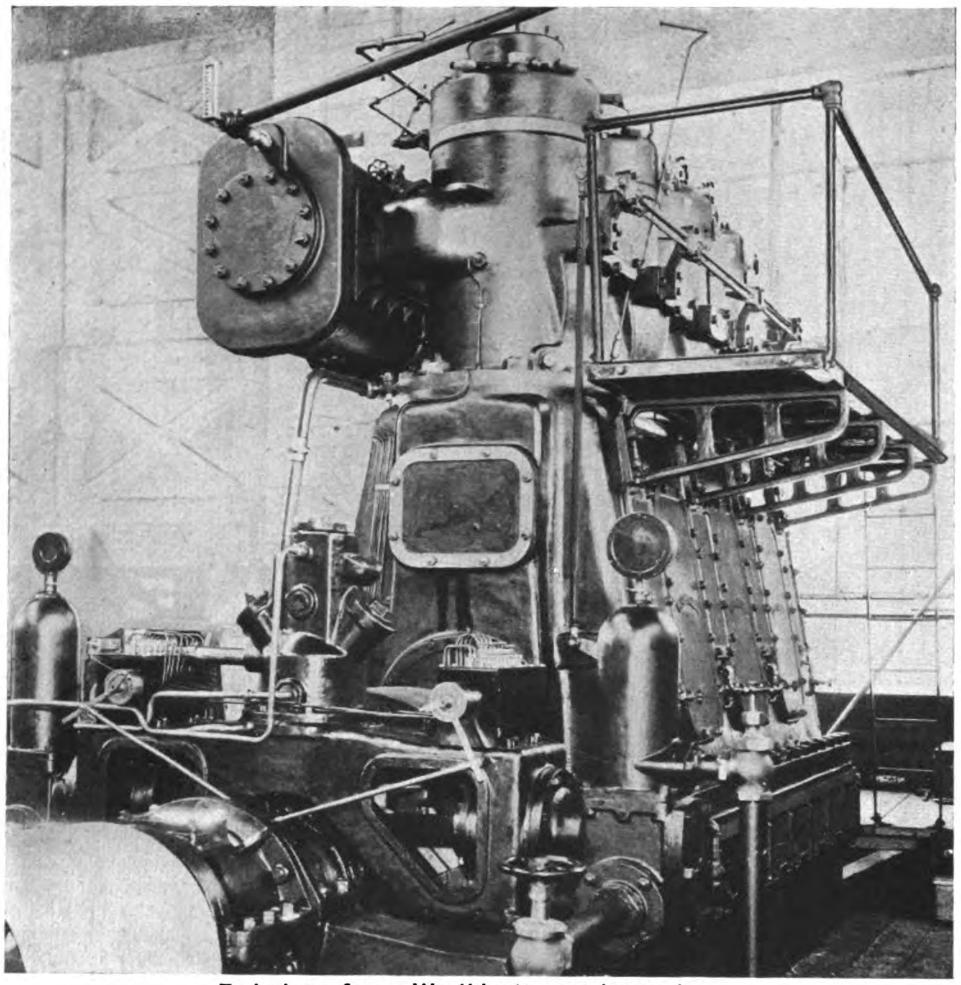


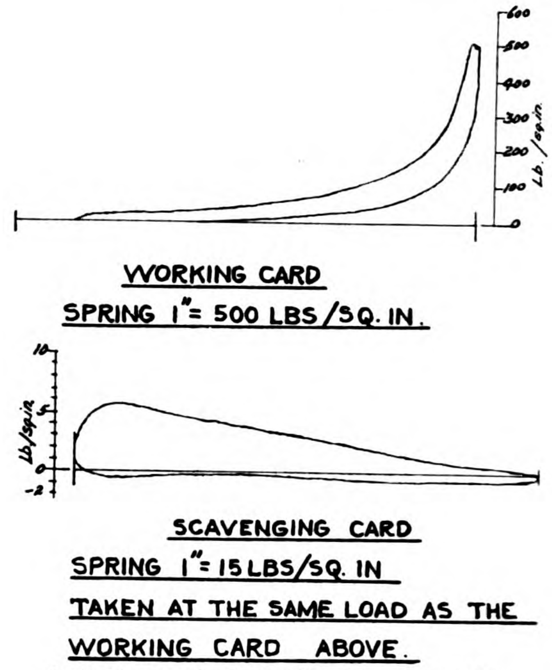
Worthington engine frame casting

ENGINE. 32 HP 10 1/4 x 11 1/2		EXPERIMENTAL ENGINE WITH FLAT TOP PISTON						DATE June 1, 1921	
No. of Test.	B.H.P at 375 R.P.M.	R.P.M.	B.H.P reduced to speed	Lbs. of Oil	Time to consume oil.	Fuel Oil Consumption: Pounds per hour	Fuel Oil Consumption: Lbs per Hr at 375 R.P.M.	Fuel Oil Consumption: Lbs. per B.H.P per Hour	Remarks.
1.	9.75	384	10	3	1359"	7.95	7.77	.795	
2	18.5	379	18.7	3	1073"	10.05	9.92	536	
3.	27.25	377	27.4	5	1402"	12.82	12.75	468	
4.	36.0	374	35.9	5	1121"	16.05	16.1	.447	
5.	41.0	371	40.6	5	998"	18.00	18.2	.444	
6.	43.0	371	42.5	5	962"	18.72	18.9	.441	
7.	44.5	369	43.8	3	562"	19.20	19.5	.439	
8.	46.0	366	44.9	5	912"	19.73	20.2	.439	

Consumption chart of new Worthington oil-engine

One of the distinguishing characteristics of this engine is the use of a divided, or two part, combustion-chamber. The function of this divided combustion-chamber is to reduce explosive pressures and to create a condition of air turbulence in the main combustion-chamber during the combustion period. Shortly before top dead-center, fuel is injected thru the spray-valve in an atomized condition directly into the smaller of the two compartments, known as the "injection chamber," this being located above and directly in communication with the main combustion-chamber or cylinder clearance space. Ignition of the fuel is from the heat of compression, and the period of injection is so timed that the partial burning of the fuel-charge in the injection-cham-


End view of new Worthington marine-engine



Indicator cards from Worthington engine

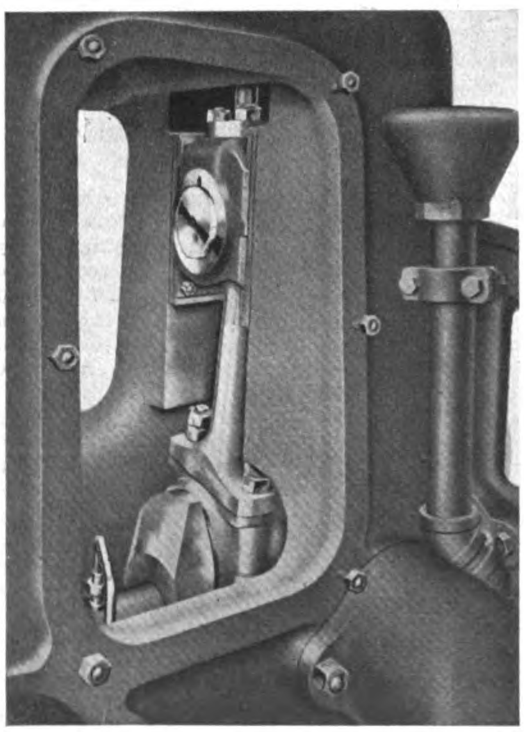
ber produces sufficient pressure to start the flow of the main part of the fuel-charge down into the cylinder until the jet of gaseous oil and air from the injection-chamber attains considerable velocity, producing a turbulent condition in the cylinder just as the piston starts on its downward stroke. This is accelerated by the downward motion of the piston.

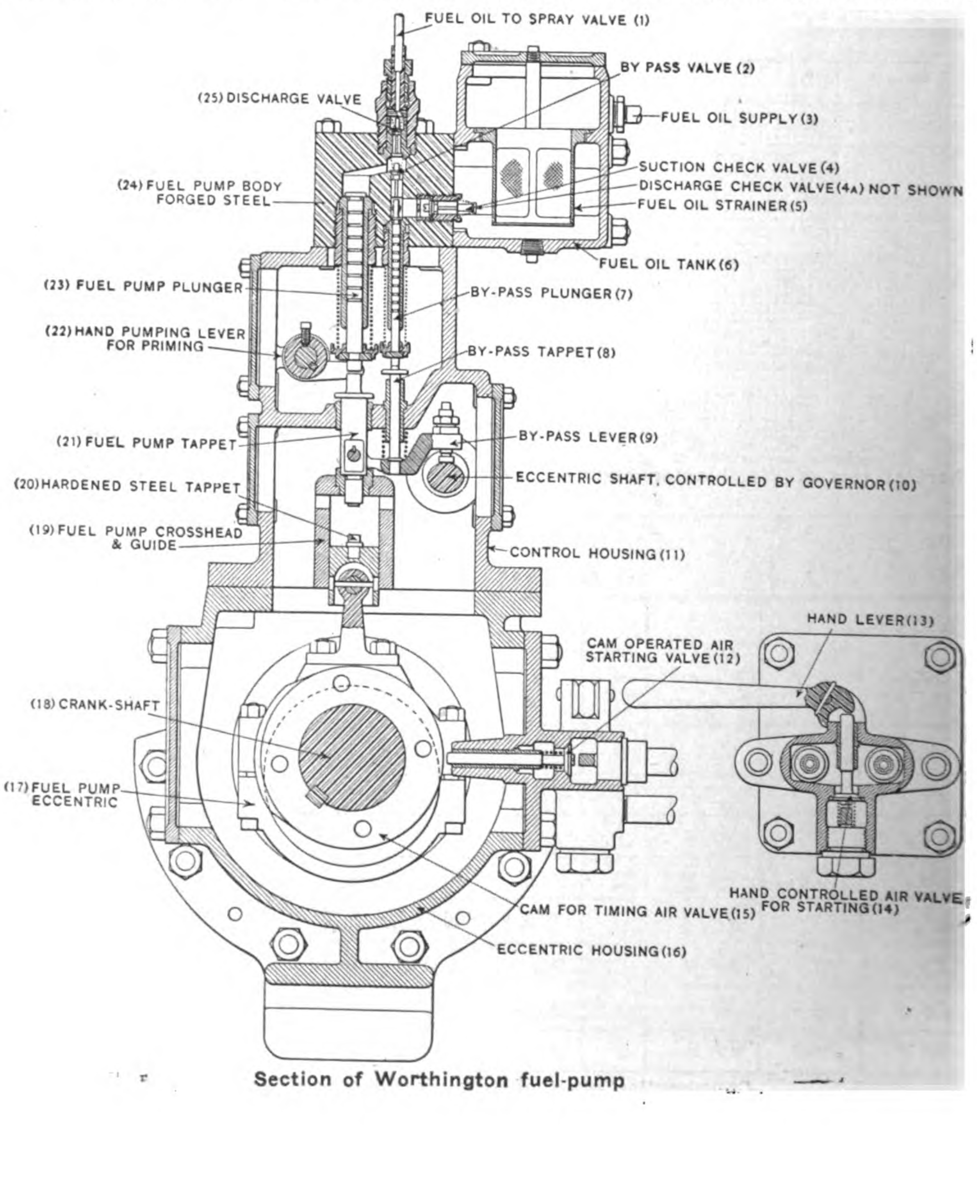
Combustion then takes place in the lower chamber or cylinder, under conditions closely approximating the air-injection Diesel-engine, the resultant expansion of gases driving the piston down on its power stroke after which the cycle described above is again repeated. The pressure from the fuel-pump is high, but lasts only during injection about 15 degrees of crank angle. It will be noted that the time and rate of combustion are independent of time and rate of pump injection.

The Worthington designers have adopted the crosshead type of running gear and providing a scavenging-air receiver or compression space for each cylinder behind the crosshead guides separate and distinct from the crank-case. On the upstroke of the piston air is drawn into this receiver through a set of Laidlaw feather valves and compressed on the down-stroke. The air is thus forced into the cylinder when the piston uncovers the scavenging-ports in the cylinder-walls, as in the crank-case compression engine but without having entered the crank-case. It will be noted that the piston-rod works in a stuffing-box between the scavenging-air receiver and the crank-case, which seals the only connection existing between these two compartments.

Another refinement of the Worthington engine consists in providing a scavenging air-connection on the base of the engine which may be piped to the outside of the engine room. By this means, a supply of pure fresh air may be had for scavenging purposes in places where the air of the engine room is charged with dust, explosive vapors, or other objectionable impurities.

The fuel-injection pump is of the unpacked type, and as will be seen from the drawing, is driven by an eccentric (17) mounted on the crankshaft. Each cylinder has a separate and independent pump, complete in all its details. By avoiding the


Looking through door in crank-case frame, showing crosshead and guide

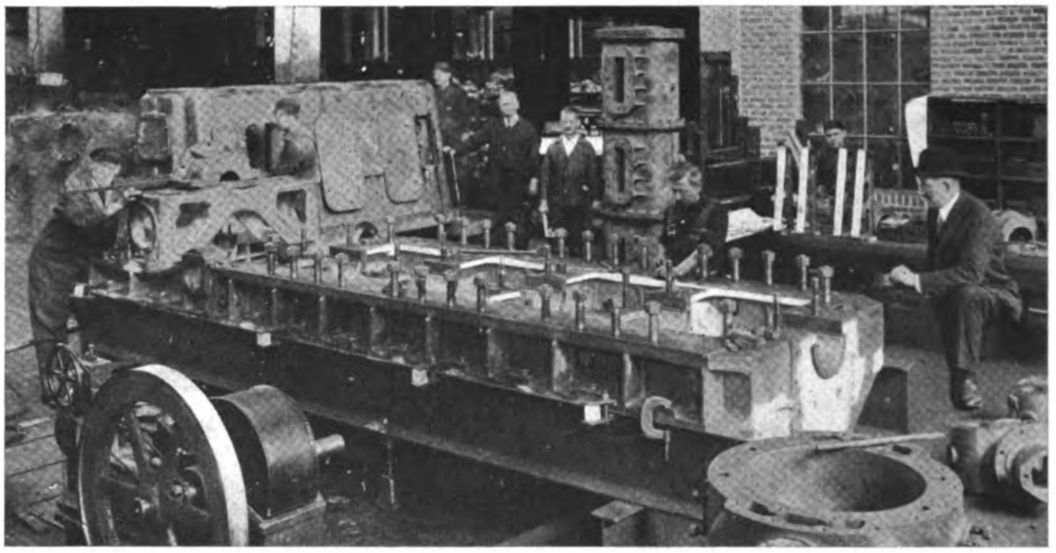


Section of Worthington fuel-pump

use of packing for the pump-plunger, danger of the plunger sticking is eliminated, and at the same time leakage past the plunger is considered less than in the usual type of packed pump. The pump body (24) is made from a solid block of steel, designed and constructed with great care, and the plungers and valves are assembled in this body as a unit.

Actuation of the pump plunger is by the eccentric (17), the crosshead (19) engaging the tappet (21), which in turn pushes the plunger upward on its injection stroke, the plunger being returned to its at rest position by the spring as the eccentric passes its top position. The actual instant at which the pump-plunger begins to move upwards determines the instant of injection of oil into the injection chamber.

For control, a centrifugal governor is fitted, acting through a series of rods and levers to rock the control-shaft (10). This shaft is turned eccentric at a point in line with each fuel-pump plunger, and a so-called "by-pass lever" (9), actuated at one end by the pump-plunger, rests at the other end on the eccentric part of the control-shaft thru the medium of an adjustable set-screw. As the end of the by-pass lever moves upward with the pump-plunger, the by-pass tappet (8) and plunger (7), resting on the lever, will move upward also, closing the gap between its upper end and the suction or by-pass valve (2). When contact is established at this point, the continued upward movement of the plunger will open the valve, permitting the oil to by-pass back to the fuel-reservoir instead of being forced thru the spray-valve, and thus ending the injection or effective pump stroke. It will be seen that by rocking the control-shaft (10) one way or the other from its normal running position, the instant of opening of the suction-valve by the by-pass plunger may be retarded or advanced, thus increasing or decreasing the effective pump-stroke and feeding more or less oil into the cylinder, according to the load requirements. Also, by regulation of the set-screw in the end of the lever (9), the instant of by-pass opening for each cylinder may be individually adjusted for purposes of initial setting and load balancing.



Bed-plate of Worthington engine, showing cylinder-head in foreground, and engine-frame and exhaust-manifold in background

The 300 b.h.p. engine has four-cylinders 15¼ in. bore by 16 in. stroke, and turns at 240 R. P. M. Fuel used on a demonstration run before and while we were at the Blake plant is a Mexican boiler-fuel of 15.6 degs. gravity at 18,198 B. T. U., with a flash-point of 222 degs. Fahr. The rating of the engine is very low, being only 37 M. E. P., but she will pull 49 without losing any perceptible economy. This fuel was supplied by the Atlantic Refining Co. and contains 3.2% sulphur. Even Soya Bean oil supplied by Marsden Wild & Co. of Boston has been used on the test-bed with excellent results. On the above Mexican oil she pulls 44 M. E. P. without trouble. With fuel of 18,500 B. T. U. per pound, a fuel-consumption not exceeding 0.50 lb. is conservatively guaranteed, but in actual practice the engine will consume about 0.44 lb., which is excellent for an engine of its power and speed.

A New German Marine Diesel-Engine

Crosshead Heavy-oil Motor of 950 Shaft H.P. Building at the Deutsche Werke, Kiel

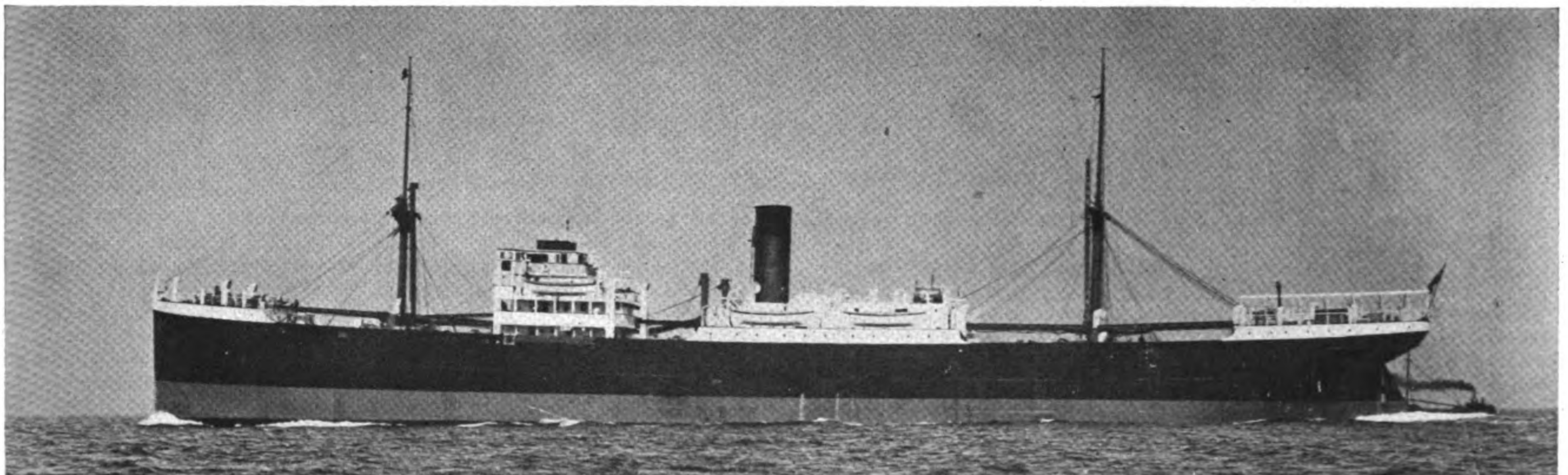
(Drawings on page 902 of this issue)

LAST month we referred to the distinction between the Deutsche Werft of Hamburg and the Deutsche Werke of Kiel, motorships being under construction at both yards. Details of work under progress at the Hamburg shipyard were given in our September issue. Recently our Danish correspondent visited the Deutsche Werke at Kiel, which is the old Imperial yard that, together with the munition plant at Spandau has been turned into a private company for peace-time production, and is under the management of Dr. Rembold, formerly with Krupps Germania works at Kiel.

At the time of our representative's visit their first Diesel marine-engine was running tests. It is of the single-acting, four-cycle, six-cylinder crosshead design, developing 950 brake h.p. at 135 R.P.M. With a view to securing a short overall length the three-stage air-compressors are mounted at the back of the engine and driven by rocking-beam levers, as are the water and oil pumps. An overall length of 28¼ ft. has resulted, which will allow of a short engine-room, say between 35 and 40 ft. Without the thrust-bearing the engine is 26¾ ft. long. Its height is 11½ ft. Should compressed-air be used for the steering-gear, an extra compressor can be fitted on the engine, and also driven by rocking beam levers. Drawings are given on another page in this issue of "Motorship."

Being of the crosshead type, the designers have been enabled to completely enclose the crankcase and shut-off the same from the cylinders by means of an entablature, thus preventing carbon from the cylinders from dropping into the crankcase, also keeping any possible cooling-water leakage from the pistons from dropping into the lubricating-oil. Generally speaking, the frames and all moving parts and the bearings follow marine steam-engine practice. Cooling of the engine is by sea-water via telescopic-tubes.

Each cylinder has a separate fuel-pump, arranged near the control levers, where they may be easily watched. The front and rear frames are cast separately with sufficient space between to remove the crankshaft without taking-out a frame. Also the piston can be lowered-out instead of having to take-off the cylinder heads, and a patented device enables easy removal of the piston. For the cam-shaft drive there are a pair of spur-wheels and two clutch-rods. The cam-shaft itself is mounted on a level with the cylinder heads, with the cams engaging directly on the roller of the rockers. Reversing is effected by sliding the camshaft after lifting the rockers clear of the cams.



Glen Line motorship "GLENTARA," which was placed in service a year ago last April. She is one of four sister Diesel-ships, and part of a fleet of over a dozen motorships owned by the Glen Line, some of which are of 14,000 tons d.w.c. and 6,600 i.h.p. The "GLENTARA" is of 10,000 tons d.w.c. and of 3,500 i.h.p. Built by Harland & Wolff. Speed, 11 knots. Fuel-consumption, 11 tons per day

Twin-Screw Freighter With Cammellaird-Fullagar Diesel Engines

Trials of the Anchor-Brocklebank Line's First Ocean-Going Motorship

TRIALS were run on the Clyde on September 29th and 30th of the twin-screw cargo motorship "Malia," built by William Hamilton & Co., Port-Glasgow, for T. & J. Brocklebank (Anchor-Brocklebank Line) Liverpool, which is notable as being the first ocean-going vessel fitted with Cammellaird-Fullagar internal-combustion engines as the main propelling power. A coastwise vessel—the all-welded-hull "Fullagar"—has already been tested with this type of machinery, but she was an experimental ship, both in hull and machinery, and her single-screw installation was found to be more powerful than was necessary as has been previously indicated in these pages. It will be remembered that it was removed and replaced by a set of Beardmore oil-engines. The original "Cammellaird-Fullagar" set now forms the port propelling-engine of the "Malia" while the starboard engine of that vessel has been constructed to the same design and of the same power, so that the "Malia" is a twin-screw ship of double the power of the "Fullagar." She is 365 ft. in length overall, 350 ft. between perpendiculars, 50 ft. in breadth, 27 ft. 3 in. in depth moulded, of 3,880 tons gross, and 6,000 tons deadweight on a draught of 23 ft.

On the trials the combined indicated horsepower of the two engines when running at 125 R.P.M. was about 1,570, or 1,100 B.H.P. On the 29th the average revolutions of both engines was 118, giving an I.H. P. of 1,480, while the speed of the ship is 10.7 knots.

The fuel-consumption of these engines works out at 0.42 lb. per shaft h.p. hour or 0.29 lb. per I.H.P. The oil used was supplied by the Anglo-Mexican Petroleum Co., and is their standard Diesel fuel-oil having a specific gravity of 0.904. After the first trip or two practically any of the fuel-oils available will be used. The lubricating-oil consumption was 0.003 lb. per b.h.p. hour, which will be reduced as soon as the starboard engine has run itself in.

A mean speed of 10¾ knots was attained at 116 R.P.M., or over a knot more than that which will be required on regular service, and 1,100 B.H.P. was developed. The fuel-consumption worked out at from 4½ to 5 tons per 24 hours, which at a price of £4.15s per ton, makes a total cost for the day's running of from £21 to £23, 15s ($84 to $95) as compared with an estimate of £34 for a coal-burning steamer of similar size and speed. To this must be added the very important facts of space saved by the abolition of boilers, water and bunkers, while it is estimated that, as compared with other internal-combustion installations now on service, there is a saving in fore-and-aft space of about 50 per cent. Therefore, it will be of interest if the builders publish the exact dimensions and weight.

The vessel carries a sufficient amount of fuel for the voyage from the United Kingdom to India and back. Oil-fuel is also used for a Vickers-Petters auxiliary engine, while a donkey-boiler supplies steam for the cargo winches. Each of the main propelling-engines weighs about 47 tons, and on the trials they worked with the slightest amount of vibration, and were almost noiseless in operation. The engines, as is well known, are of the four-cylinder, opposed-piston type, the cylinders being 14-in. in diameter and the stroke of each piston being 20-in. which means an actual stroke of 40-in. The pressure was about 1,000 lb. per square inch.

There was on board a large number of engineers and others representing shipbuilding and engineering firms, and the opinion was expressed by all of them that the machinery installation was one of the most perfectly balanced of which they had never had experience, and ran with remarkable smoothness and lack of vibration. In the reversing trials, it may be added, the vessel was put from full-speed ahead to full-speed astern in the short time of six seconds.

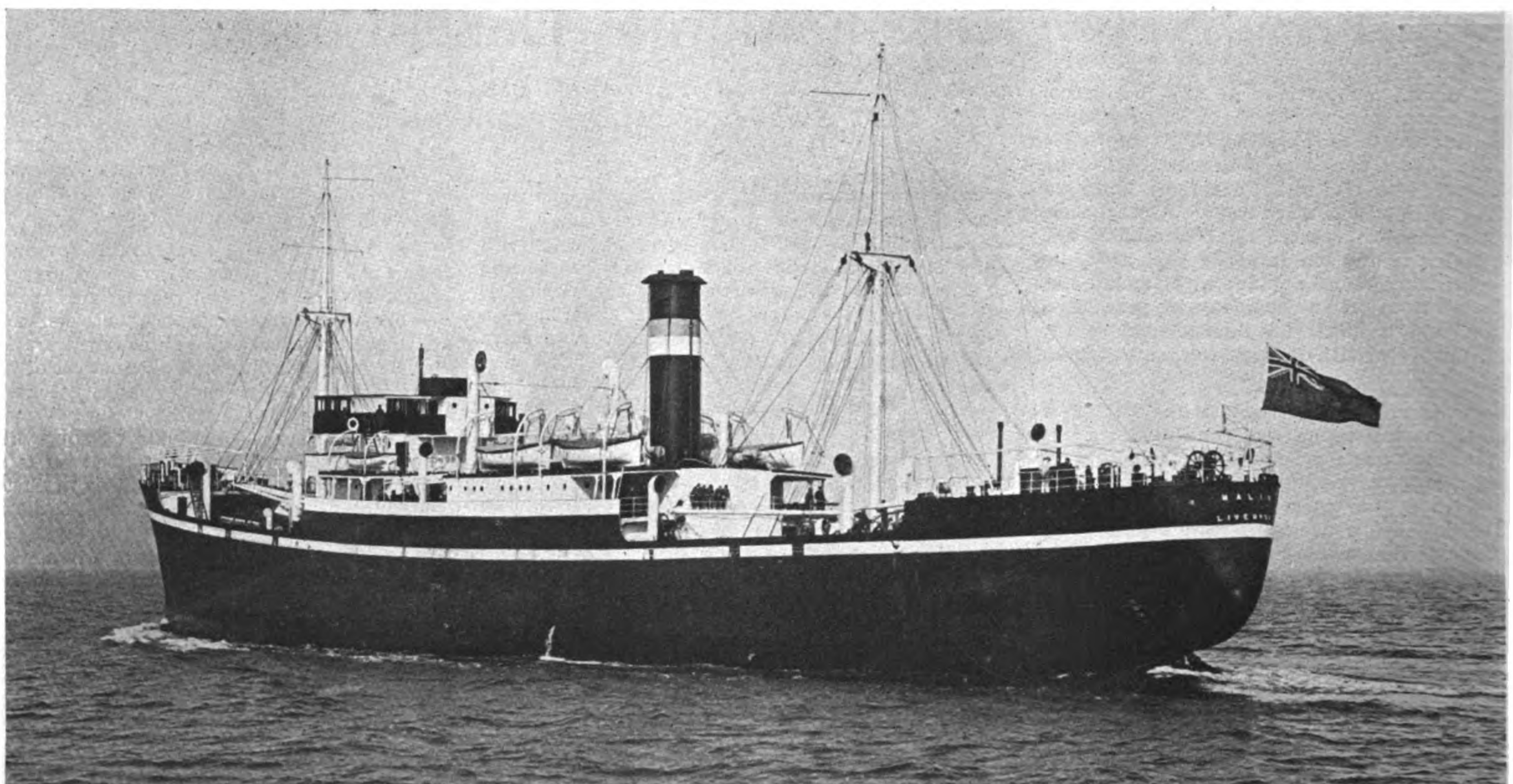
It is interesting to note that only two days were required to tune up the engines before commencing official trials, and it is therefore unlikely that Cammell Laird & Co. will go to the expense of running any more of this particular size of engine on the test-bed, but will follow the steam-engine practice and the practice of several other leading Diesel-engine builders, of installing them in the ship direct without official tests. The trial results of a similar engine have already been published and need not be repeated. It should, however, be stated that the second of the two engines for the "Malia" was run at a B. H. P. of 540 with a perfectly smokeless exhaust, and that, due to improvements in the ports, the scavenging-air pressure was reduced to the low figure of 1 lb. per square inch. The turning-gear for both engines is driven by one 4 B.H.P. English Electric Co., electric-motor with a cross-shaft and worm-gear.

The engines were built and the whole of the machinery installed under the supervision of Messrs. G. S. Goodwin & Co., of Liverpool.

An electric steering-gear of the Hele-Shaw type is fitted, enabling the donkey boiler to be completely closed-down when the ship is at sea.

It is the builders' practice to arrange for each engine to drive all pumps and auxiliaries necessary to make it a self-contained propelling unit, and the fuel-consumption of "Camellaird-Fullagar" engines hitherto published have been for such engines. In the present installation, however, for particular reasons of the owners, the oil and water circulating pumps are separately driven. Seawater, freshwater circulating and lubricating oil-pumps have all been duplicated, each pump being of capacity enough to supply all necessary water or oil as the case may be for running both engines.

Two combined dynamo and air-compressor sets are installed, one on the port and the other on the starboard side of the engine-room. Each set is driven by a two-cylinder Vickers-Petter hot-bulb engine developing 78 B.H.P. at 300 R.P.M. Three small air-bottles are supplied with each set for starting purposes. Each engine is direct coupled to a 45 K. W. Allen dynamo, and through a clutch to a Reavell 3-stage quadruplex air-compressor capable of pumping 125 cubic-feet of free air per minute to the bottle storage-pressure of 1,000 lbs. per square inch. Twelve air-bottles are fitted on the forward engine-room bulkhead for storage of the starting air.



Anchor-Brocklebank's new motorship "MALIA," propelled by twin Camellaird-Fullager Diesel-engines

An auxiliary air receiver of 30 cubic feet capacity, storing air at a pressure of 200 lbs. per square inch is fitted in the 'tween deck at the port side, for supplying air to the windlass, donkey-boiler feed pump, oil firing gear and ballast pump, when the donkey boiler is not in use or when steam is being raised. In addition to the main generators, an emergency lighting set is fitted on the port side at the main deck level. This is driven by a single-cylinder Vickers-Petters hot-bulb oil-engine developing 10 H.P. at 425 R.P.M. The Allen dynamo is of 5 K.W.

Notes on Motorship Operation

Personal Experiences, and Observations of Conditions on Domestic and Foreign Diesel-engined Vessels

By OLD TIMER

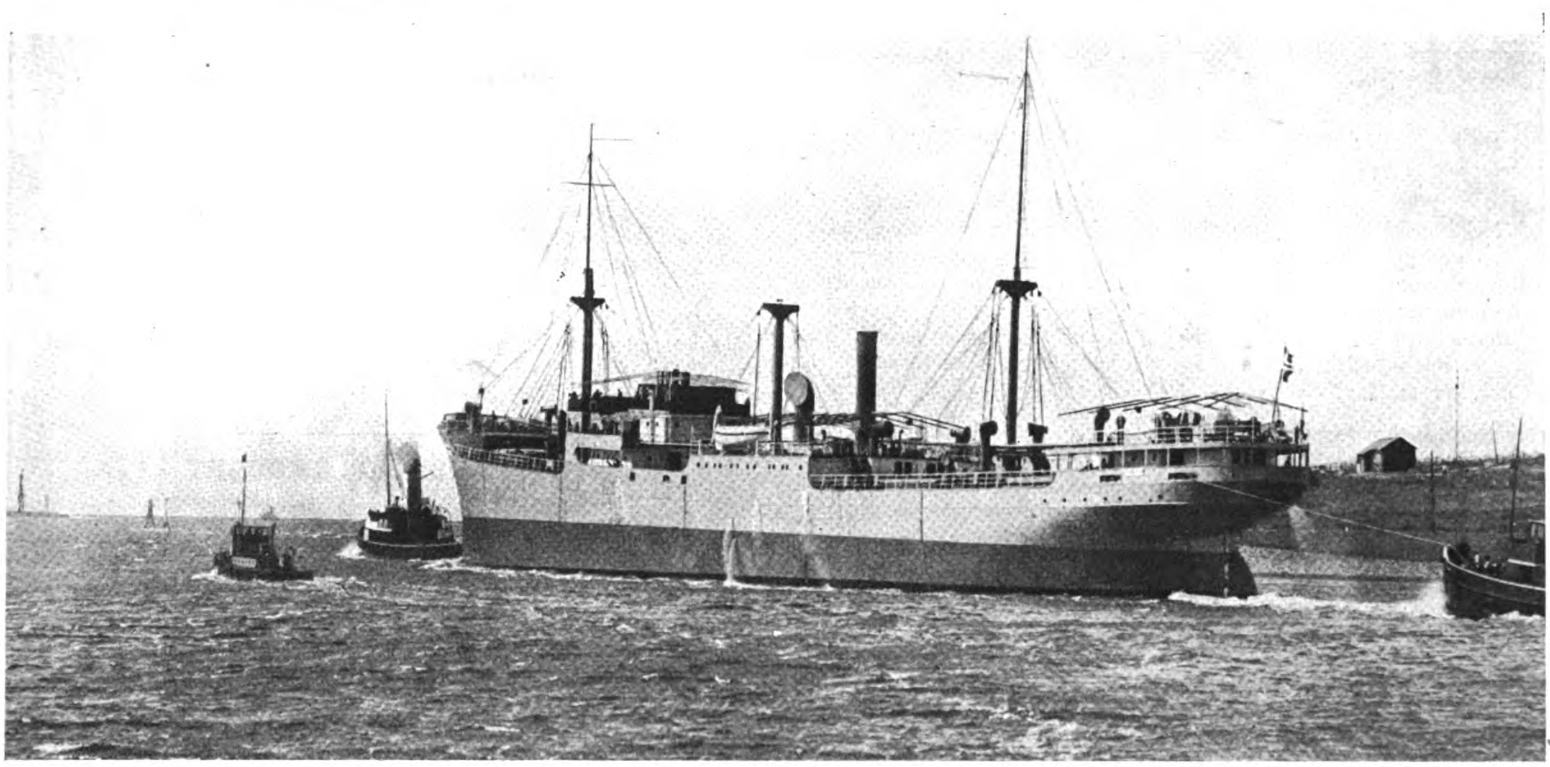
I WAS one of the first men in U. S. A. to operate a twin-screw American built Diesel oil-engined boat, the machinery installation of which was carried out by myself on Chicago River, Ill. Without any dock trials, the engine-builder and the owner ordered the Captain to proceed to Mackinac Island, a run of 340 miles from Chicago. A non-stop run was made with engines turning at 300 revolutions. The present Editor of "Motorship," (at that time Power Editor of "Rudder") was aboard. I operated this boat for three seasons on the Great Lakes and the Craig engines did not cost $25.00 to the engine-builder or owner for repairs or alterations. Since that time, I have visited many American-built Diesel-engined yachts and commercial boats, and had talks with the different chief-engineers about their experiences and their little troubles. I find that all their troubles are small ones compared with the repairs that have to be done on reaching port with steam-engines.

The usual work on the Diesel-engine in port, comprises of grinding-in the valves, namely fuel, air-starting, exhaust, inlet and safety valves, which should be done in routine at each end of a voyage so that every valve will get attention in its turn, using the log-book as a guide. As the compressor is the life of the Diesel-engine, its valves should be attended to with regularity. If they should begin to leak the pressure-gauges will give a warning. Main bearing and crank-pin boxes will soon let you know when clearances becomes too great.

The writer was in Mobile, Ala., some months ago, and upon going aboard an American motor-vessel at dock undergoing a general overhaul for Lloyd in the engine-room, found a gang of machinists stripping the main motors. Three men were trying to remove a fuel-valve, a one-ton chain-block was hooked to the valve and two 4 ft. crow-bars were used to remove the valve. After it was removed and placed on engine-room floor I carefully examined it with others. They were in such shape that they had to be put in lathe and faced-off before using again. On making enquiry from the 1st engineer, I found that fuel-valves had not been out of the cylinder heads in 12 months. Such neglect leaving the valves so long in the heads and having to machine the same, adds to the cost of upkeep, and causes men who are investigating cost of maintenance and so forth of the Diesel-engine to ponder. Upkeep is so great on some ships caused by loose methods in the engine-room, that they are afraid to adopt Diesel power.

Some weeks ago I was aboard the Dutch built Norwegian 9,500 tons motorship, "Tosca" in New Orleans. She is equipped with twin 1,400 i.h.p. Werkspoor Diesel-engines. As it was my first visit aboard such a large motorship, I was surprised at the equipment. Two 100 h.p. auxiliaries on the starboard and one 100 h.p. on the port side, everything in dual, with all pumps on port side making a very fine layout. Certainly it was very interesting to me.

The 1st assistant engineer operated the port engine for my benefit, not only on air but three cylinders on oil, then six cylinders, both ahead and astern. The eccentric reverse-motion is of the latest Werkspoor type. Three stage air compressors on three cranks at forward end of engine, used for fuel injection also for the starting-bottles. One of the auxiliaries was running supplying lights also charging starting-bottles, getting ready for sea, and it was practically noiseless. After two hours in the engine-room, I felt as I would like to make a trip on "Tosca" in any capacity in engine-room for my own benefit. However, my wife went to London as a passenger, and it will be interesting to have a woman's view of a voyage on a motorship. This ship had been in port eight days when I made the visit. The engine-room was perfection, all the hand-rails were highly polished, also all bright parts of the Diesel-engines, and was a credit to the chief and engine-room force.



Winge & Co.'s new Werkspoor Diesel-engined motorship "GEISHA" passing out at the Hook of Holland en-route for her sea-trials. She is a sister motorship to the "TOSCA," also referred to on this page

Werkspoor-Engined Motorship "Geisha"

On this page is an illustration of Winge & Co's new motorship "Geisha", of which drawings were published in our issue of February, 1920, prior to her completion. She was placed in service during September last. Further details and revised dimensions are now available, and her general dimensions are as follows:

Displacement (loaded)	10,260 tons
Displacement (light)	3,255 tons
Deadweight capacity	6,990 tons
Net-cargo capacity on 10,000 mile's voyage	6,150 to 6,250 tons
Cubic-capacity of holds	381,454 cu. ft.
Capacity of deep-tank (cargo only,	9,719 cu. ft.
Total cargo capacity	391,173 cu. ft.
Capacity of fuel-bunkers (D. B.)	37,215 cu. ft.
Power	2,880 I.H.P.
Engine and propeller speed	125 R.P.M.
Propellers, 11 ft. 9¾ in. dia. by 10ft. 2 in. pitch with 3.6 sq. meters projected area	
Diameter of tail shaft	12.204 ins.
Ship's loaded speed	11 knots on 23 ft., 1 in. draft
Mean indicated-pressure	100 lbs. per sq. inch
Daily fuel-consumption	10 tons
Number of machinery staff	six engineers, eight oilers
Weight of complete engine-room machinery	550 tons
Weight of twin main-engines	275 tons
Length of machinery space	46 ft.
Type of auxiliary machinery	Diesel-electric
Length of ship (O. A.)	119.175 meters
Length (B. P.)	114.300 meters
Breadth (M. D.)	15.620 meters
Draught (loaded)	7.342 meters

Consulting-engineers who maintain that Diesel-engines are heavier than steam-machinery and occupy more space, will do well to check-up the weight of the machinery of the M. S. "Geisha." As will be seen by referring to the drawings we previously published, the total machinery space for nearly 3,000 horse power is but 46 ft.; while the complete engine-room machinery (main engines, auxiliary-engines, generators, gratings, pumps, thrust-blocks, fuel and air-tanks, etc.), only weighs 550 tons. The engine-speed is not high, being rated at 125 R. M. P., but in service about 110 to 115 revolutions are generally maintained.

The propelling plant consists of twin six-cylinder four-cycle type, Werkspoor Diesels, each 22.047 in. bore by 39.370 in. stroke, built at the Werkspoor Works, Amsterdam, Holland. The hull was built by their adjoining yard, the N. V. Nederlandsche Scheepsbouw (Netherlands Shipbuilding Co.). The vessel operates under the Norwegian flag, with Christiania as her home port.

BURMEISTER AND WAIN OPEN AMERICAN OFFICE

With a view to furthering the sales of their Diesel-engines in America (which they are able to do under their license agreements) and for general business purposes, Burmeister and Wain of Copenhagen have opened a New York office at 27 Whitehall St., with H. C. Hallings in charge. Mr. Hallings is also marine-superintendent of the United Steamship Line.

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MOTORSHIP

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WANTED—A MAN OF RESOLUTE PURPOSE, FINANCIALLY BACKED BY CONGRESS!

Everyone, including farmers and others in the Middle West, realize that steps bordering upon radical action must be taken if our merchant-marine is to continue carrying the American flag at the taffrail to all parts of the world. Yet some marine-men are inclined to consider "Motorship" a little over-enthusiastic in publishing suggestions to sink a thousand of the worthless wooden and steel ships, and convert several hundred of the better steel hulls to economical Diesel power, which, of course, would be radical and would require the sound common sense and unshaken nerve of a big man with vision like General Dawes to take the initiative and responsibility, and who would do what he said, not dally for week after week without accomplishing anything tangible—or, in other words, a man who would not play politics in Washington!

Something can be saved from the ship-wreck by carefully throwing a little additional good money after the bad. The country is too deeply involved—too many billions have been spent, to let our entire fleet rust. So we believe the nation will be willing to spend a hundred millions or so if it can be demonstrated that a number of idle ships can be converted to first-class motorships capable of competing against foreign vessels. But whether the nation is willing, or not, for the Shipping Board to spend the money is another matter!

Probably the solution rests with the Board being empowered to turn such hulls over to shipowners at an extremely low cost on the understanding that oil-engines are to be installed, and at the same time make a financial grant towards the conversional costs, and this to be in accordance with the final cost to the shipowner on the basis that by the time the vessels are ready for sea they do not cost him more than similar ships can be purchased today in Great Britain and Continental Europe. This to be guaranteed by the Board. The shipowners, of course, will select and buy the engines.

That the various "radical" proposals made in "Motorship" are worthy of most serious consideration is indicated by the recent speech of that worthy and experienced American shipowner, Frank E. Munson, president of the Munson Steamship Line, who said:

> "Each of the approximately five hundred steel cargo ships of the United States Shipping Board, ranging from 3,000 to 7,000 tons, and now tied up, should be equipped with Diesel engines or electric drive and sold. Suppose it cost $150,000 to $250,000 to re-engine the ships, they could be sold readily at $350,000 to $500,000. They could be placed in profitable service and the board not only relieved of this large amount of tonnage which is now hanging over the market, but it would also receive cash working capital. This is one of the first powers Congress should give the board."
>
> "With this work begun thousands of unemployed men would be given work; buying capacity would be partially restored so that every line of business would profit and the ship-yards would again be active. The owners of these ships, many of them as fine vessels as are afloat to-day, could laugh at all this talk of foreign competition. Higher wages would be more than offset by the economies of operation, quick turn around and the driving force of American organization.
>
> "The wooden ships should be dismantled and sunk," Mr. Munson said. "They were a war experiment and served their purpose. Recognize it and get rid of the junk."

A sentiment in favor of such action is growing among congressmen, including Senators Wesley L. Jones, Duncan U. Fletcher, Representative G. W. Edmonds and others. In a recent letter to us, Mr. Edmonds said:

> "It was with pleasure that I listened to the speech of Mr. Frank Munson, made during the voyage of the "Southern Cross" from Philadelphia to New York. Mr. Munson is one of our most able shipping operators, and when he praised so highly the "motorship" as the coming vehicle of trade, he only confirmed my convictions made in 1916, *and urged by me upon the various chairmen of the Shipping Board, I regret to say without any action on their part.* Perhaps it was not possible to carefully develop or study the various motors during the war, with positive assurance of the results desired, but it is now becoming more evident every day that the motor for economy and efficiency is far in advance of any other type of propulsion for shipping. It will be absolutely necessary for us whenever opportunity occurs, or changes can be made reasonably, to endeavor to instal and place in operation ships of this type. In my opinion the future control of commerce will be attained by the nations using this method of propulsion for their ships."

If the Chairman of the Board has more vision than his predecessors he will find in this "conversion to economical motorships" proposal an excellent platform to put before the country, and the Board afterwards can gracefully retire, leaving shipowners with a fleet of vessels that can hold their own in competition with all nations. Economy is paramount today, but the nation will agree to a moderate additional expenditure if assured of economy resulting. Is Mr. Lasker the big man for the job and sufficiently far-sighted to see the splendid opportunity, or will he follow the lead of most of his predecessors and play politics?

PROMINENT BRITISH NAVAL ARCHITECT'S OPINION

In a review of the present shipbuilding and ship-operating position, Maxwell Ballard, a well-known British naval-architect, recently stated:

> "It would be an oversight in passing the replacement question to ignore the handwriting on the wall. There is not a progressive shipowner to-day who is not alive to the inevitable—the substitution of the vastly more economical motor-vessel in place of steamers. The next few years will see considerable such building, or Germany will quickly lead in efficient and economical tonnage. Without doubt the American Fleet contains many fine and well-constructed vessels, also a lot of junk. It is surely not without reason that an American shipping journal, in addressing Mr. Lasker, soberly suggests that he should sink 1,000 worthless steamers or more to hold back the flood of money going to waste."

As British shipping men have many more years of ship-operating experience than most Americans, and as they are closely watching America's merchant-marine, they are in a position to see a little further ahead than Washington appears able, so the Shipping Board as well as shipowners should ponder awhile over Mr. Ballard's remarks. Incidentally we note with interest that he reads "Motorship," as he quotes from the article published on page 635, of our issue of August last.

CAUSE FOR THOUGHT

Directly contrasting with shipyards where steamship and steam engine construction is carried out exclusively, Burmeister & Wain, of Copenhagen, are working three shifts per day in their engine-shop. Motorships and Diesel-engines are constructed exclusively at this well-known yard. This position of affairs is worthy of serious consideration by the various American shipyards who have not yet turned to merchant-marine Diesel-engine construction. Twenty-four hours per day building Diesel engines is worthwhile.

EVERY DAY WE LEARN!

All this talk about Diesel-engines for the American merchant-marine is British propaganda, says Edgar Pennington Young, publisher of *The Marine Journal.* If this is really so we must call motorships "hush-hush ships," and re-name this publication "Hush-Hush!"

AN OPPORTUNITY LOST

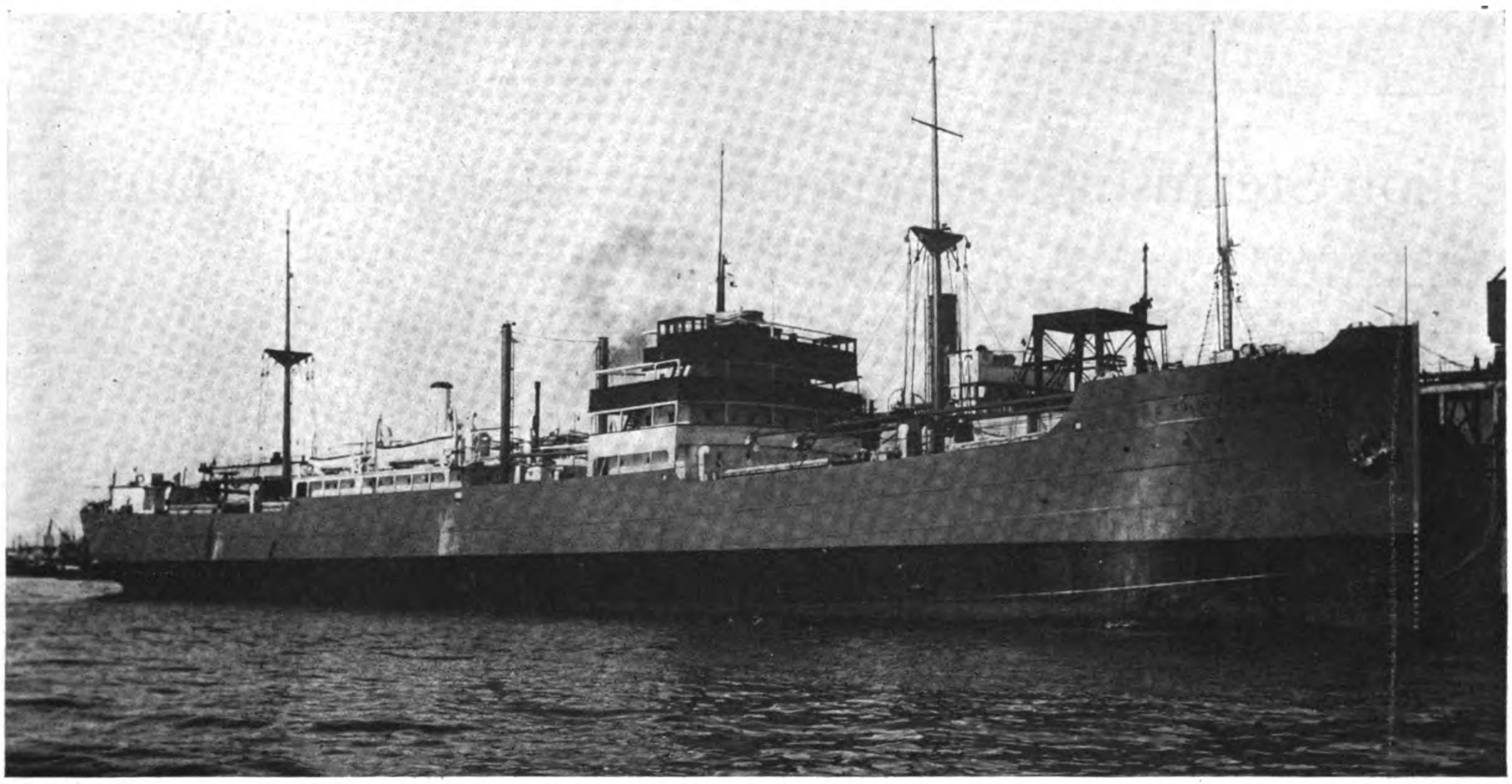
Recently the Ward Line awarded a contract for reconditioning the passenger steamship "San Jacinto," including the installation of four new boilers, new reciprocating steam-engines and the installation of fuel-oil tanks as well as changes to the accommodation. We understand this will cost more than a million dollars. The "San Jacinto" is a ship 6,069 tons gross, 380 ft. long by 53 ft breadth, so appears to be an ideal vessel for the installation of Diesel-engines or Diesel-electric drive—this time being a splendid opportunity to do the work at low cost. It seems extraordinary that the Ward Line should have arranged to put new but uneconomical steam-engines and boilers in these days of absolute reliability of the Diesel engine, and with so many excellent makes of Diesel engines available in the United States. A somewhat similar case is that of the Mallory Line's vessel "Henry R. Mallory," for which the contract has just been awarded to the same yard for rebuilding engine foundations and the installation of new auxiliary machinery at a cost of $45,700. The "Henry R. Mallory" is of somewhat similar size, being 6,063 tons gross, but a little longer overall.

First of Sixteen Diesel-Driven Ore-Carriers Runs Trials

Reference has been made at various times in "Motorship" to the fleet of 18 ore-carrying ships ordered by Trafikaktiebolaget Grangesberg-Oxelosund of Stockholm, Sweden, from the Götaverken of Göteborg of which sixteen are to be Diesel-driven—the first two having been steam-driven. The first of the motor vessels is the "Strassa" 8,350 tons d.w.c. Her trials were run on Sept. 24th, in very rough weather with a wind of 14 meters a second, yet the result was very excellent. The ship was light with the exception that the double-bottoms were filled with fuel-oil, giving her a displacement of 5,800 tons on a draught of 11 ft. 3 in. forward and 15 ft. 11 in. aft. She was described on page 581 of our July number.

During the full-power trials the twin engines together developed 3,085 i.h.p. at 145.8 r.p.m., giving the ship a speed of 12.4 knots. For the trials proper, the engines developed 2,643 i.h.p. at 136.8 r.p.m., the ship averaging 11.70 knots with a propeller slip of 5.07 per cent. The fuel-consumption was registered as 0.142 kg. per i.h.p. hour for the main engines, or 0.149 kg. per i.h.p. hour, including all auxiliary machinery.

It will be remembered that this well-known Swedish Ore Company only adopted Diesel-drive after very careful investigation. The results of the trials have made the builders confident that the owners will very soon discover that the practical results will be the same as the theoretical conclusion arrived at by a Committee who had to decide upon the question of Diesel or steam drive.

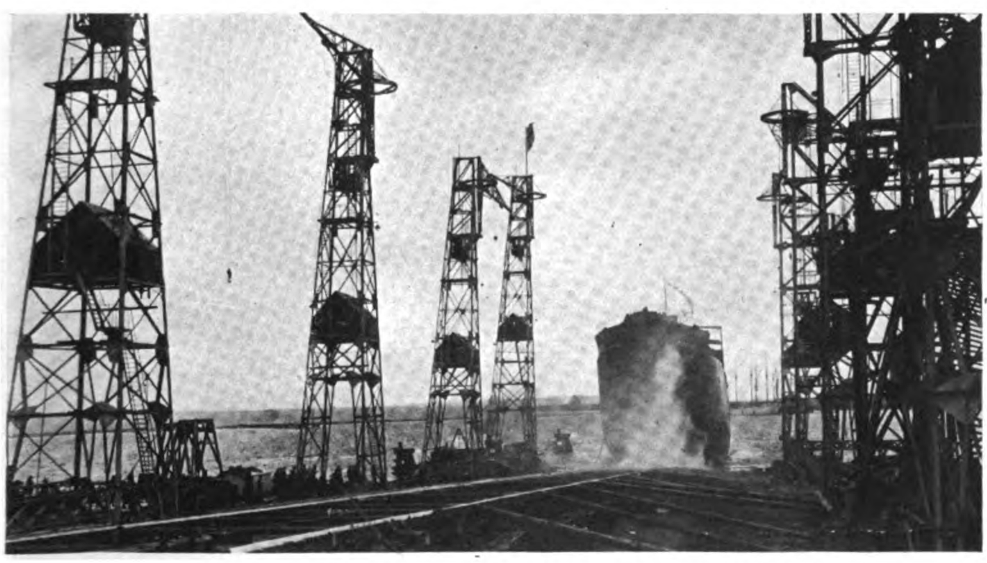


"STRASSA," the first of sixteen Diesel-driven ore-carriers at the Göteverken for the Grangesburg Oxeslund

LAUNCH OF MOTORSHIP "CANTON"—SWEDEN'S LARGEST MERCHANT SHIP

Drawings of a 10,400 tons deadweight motorship building at the Oresundsvarvet, Landskrona, Sweden, were given in our issue of January last. This vessel, the "Canton", was launched on Sept. 24th, and is noteworthy as being the largest merchant-ship yet built in Sweden. Her overall length is 440 ft. At that time we stated that she was building to the order of the Swedish Orient Line. However, she will be operated by another of Dan Brostrom's enterprises; namely The Swedish Asiatic Company, that also owns the motorship "Formosa". The twin 2,000 i.h.p. B. & W. Diesel-engines of the "Canton" were built by the Götaverken, and are similar to those in the "Bullaren," "Tisnaren", and "Elmaren". They will turn at 100 R.P.M. and are expected to give the ship a speed of 12½ knots. Their cylinder bore is 740 mm (29.134 in.) by 1100 mm (43.307 in.) stroke, or 50 mm (1.968 in.) less stroke than have the 2250 i.h.p. engines of the "William Penn".

It is significant to note that the motorship "Afrika" is the largest merchant-vessel ever built in Denmark, while the Sulzer-engined motorship "Handicap" is the largest vessel ever built in Norway, so motorships have set the size record in three Scandinavian countries. Very shortly motorships of 15,000 tons d.w.c. will be built in Denmark at the Nakskov Yard.



Launch of Swedish East Asiatic Co.'s new Motorship "CANTON"

ANOTHER DIESEL-MOTOR CABLE-SHIP

Bids have been asked by the Great Northern Telegraph Company of Copenhagen on a twin-screw cable-laying motorship of 350 ft. length and of 2,400 shaft h.p. for service in Chinese waters. Unlike the Western Union's Diesel-electric cable-ship, this vessel is to have direct Diesel drive; but there will be an auxiliary Diesel-electric generating-set for operating the cable-laying plant. It is probable that two 1,200 i.h.p. Burmeister and Wain engines will form the propelling plant.

DIESEL-DRIVEN TRAINING MOTORSHIP RUNS TRIALS

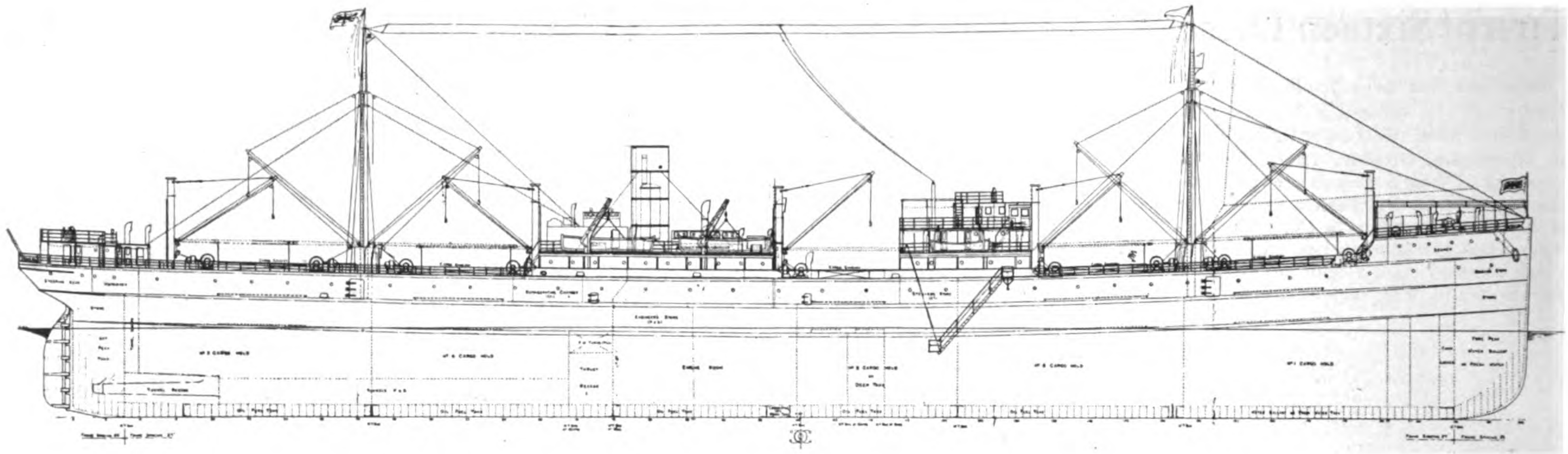
Following her sea-trials the East Asiatic Company's new fully-rigged Diesel-auxiliary "Kjobenhavn," 6,000 tons deadweight, arrived at Copenhagen on October 5th. She carries a crew of 50 men and 12 apprentices.

MOTOR-TANKER "SCOTTISH STANDARD" RUNS TRIALS

Trials were run on Sept. 29th of the Vickers Diesel-engined tanker "Scottish Standard," 10,000 tons deadweight, built by Vickers Ltd. for Tankers Ltd. of London. The owners are associated with the Scottish-Mexican Oil Company of 120 Broadway, New York, who advised us nearly three years ago that they would construct a fleet of motorships. Three sister motorships are now nearing completion to their order at Vickers.

MOTORSHIP AND STEAMER COLLIDE

The steamer "Edam" collided with the motorship "Glenogle" on September 29th. Both vessels were badly damaged, but the "Glenogle" reached Rotterdam safely.



Union Steamship Company's Big Motorship "Hauraki"

Details of New 10,600 tons d.w.c. North British Diesel-Engined Freighter Which Has Big Cargo Capacity.

ONE of the principal features about the new cargo motorship "Hauraki" built for the Union Steamship Company of New Zealand for trade on the Pacific and Indian Ocean with New Zealand and Australia, is that no other class of vessel can circumnavigate the world without taking fuel enroute and yet carry such a large general cargo in proportion. Had this freighter (which was referred to in our October issue as "Mauraki") been coal-fired, she would consume 66 tons per day and average only 11½ knots; whereas her fuel-consumption with Diesel drive will not exceed 16 tons per day, while her average loaded speed will be 12½ knots.

It is interesting to record at this time that the owners of this ship have been subscribers to "Motorship" for several years, carrying subscriptions for their London and Glasgow offices, as well as for their head-office in New Zealand. So we think it very probable that their decision to order this vessel was to an extent influenced by the useful information published in various issues of this publication.

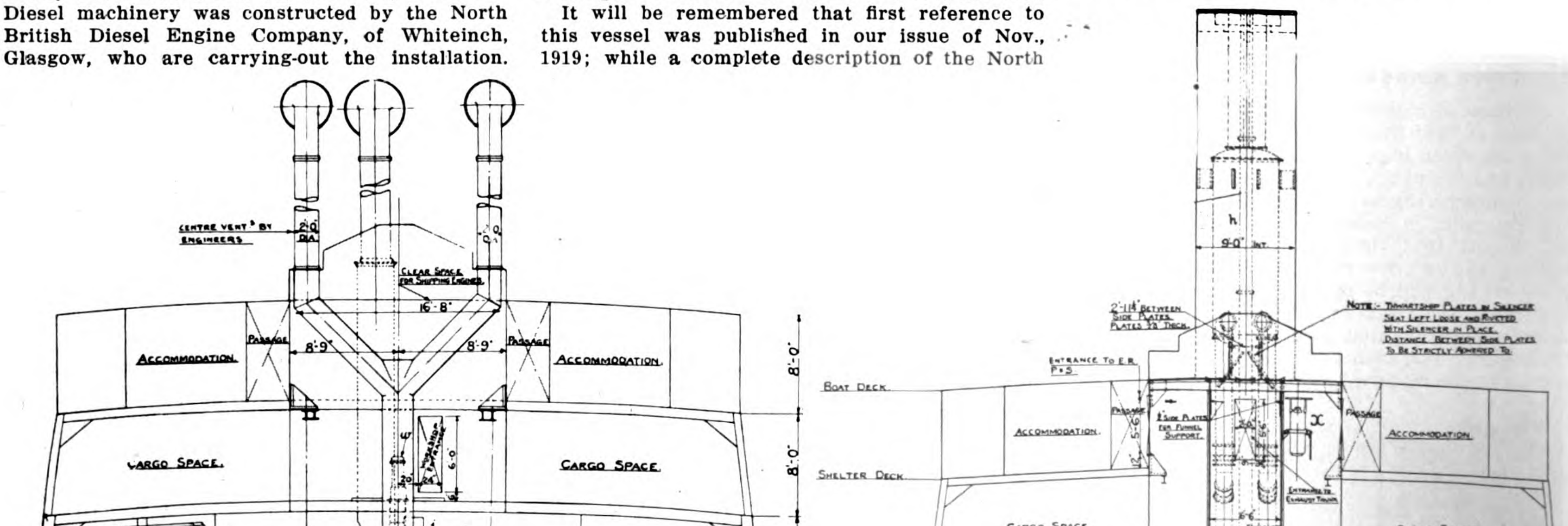
She is an unusually fine-looking vessel for a freighter and was launched Aug. 24th last by Denny Bros. of Dumbarton, Scotland, while her Diesel machinery was constructed by the North British Diesel Engine Company, of Whiteinch, Glasgow, who are carrying-out the installation.

The fuel is carried in all double bottoms and peak and if necessary the deep-tank can be loaded with fuel-oil totaling about 2,950 tons in all. But it is doubtful if fuel-oil will ever be carried in her deep-tank because less than the above quantity will enable her to circumnavigate the world. Therefore, we presume that her deep-tank will be used for cargo only. On a 6,999 nautical-mile voyage, taking in fuel at each terminal point, the "Hauraki" will carry 1,000 tons more weight cargo than a similar vessel with steam-engines coal-fired, and take one day less to cover the distance. Her overall dimensions are as follows—

Deadweight	10,600 tons
Power of main engines	4,000 i.h.p.
Power of auxiliary engines	600 b. h.p.
Speed	12½ knots
Daily fuel-consumption	16 tons
Length (BP)	450 ft.
Breadth	58 ft.
Depth	34 ft.
Loaded draft	27 ft. 6 in.
Passenger-accomodation	8 first class

It will be remembered that first reference to this vessel was published in our issue of Nov., 1919; while a complete description of the North British Diesel engine appeared in our issues of May and July, 1921, only the engines described were of 2,300 i.h.p. at 96 R.P.M.; whereas the engines of the "Hauraki" are a little smaller in power. Two engines are installed, each six-cylinder sets of the four-cycle type, 26½ in. bore by 47 in. stroke, having an output of 1,750 I.H.P. each at 96 R.P.M. Otherwise the general design follows the larger sets with, of course, a few minor modifications. There are three auxiliary Diesel-engines, two of which are arranged at the starboard side and one on the port-side of the engine, all coupled to electric-generators at 220 volt. They are four-cylinder sets 11½ in. bore by 14½ in. stroke each developing 200 b.h.p. at 375 R. P. M.

The vessel is not insulated for meat cargoes, but her provision chambers are insulated and an ammonia plant is installed. The captain and officers are berthed near the bridge, and the engineers around the engine casings all in large comfortable cabins. In addition, there is accommodation for 8 passengers. It is interesting to note that main air-compressors are driven-off the crankshaft of the main engines and consist of twin three-stage sets. The following are details of the auxiliary machinery installed.



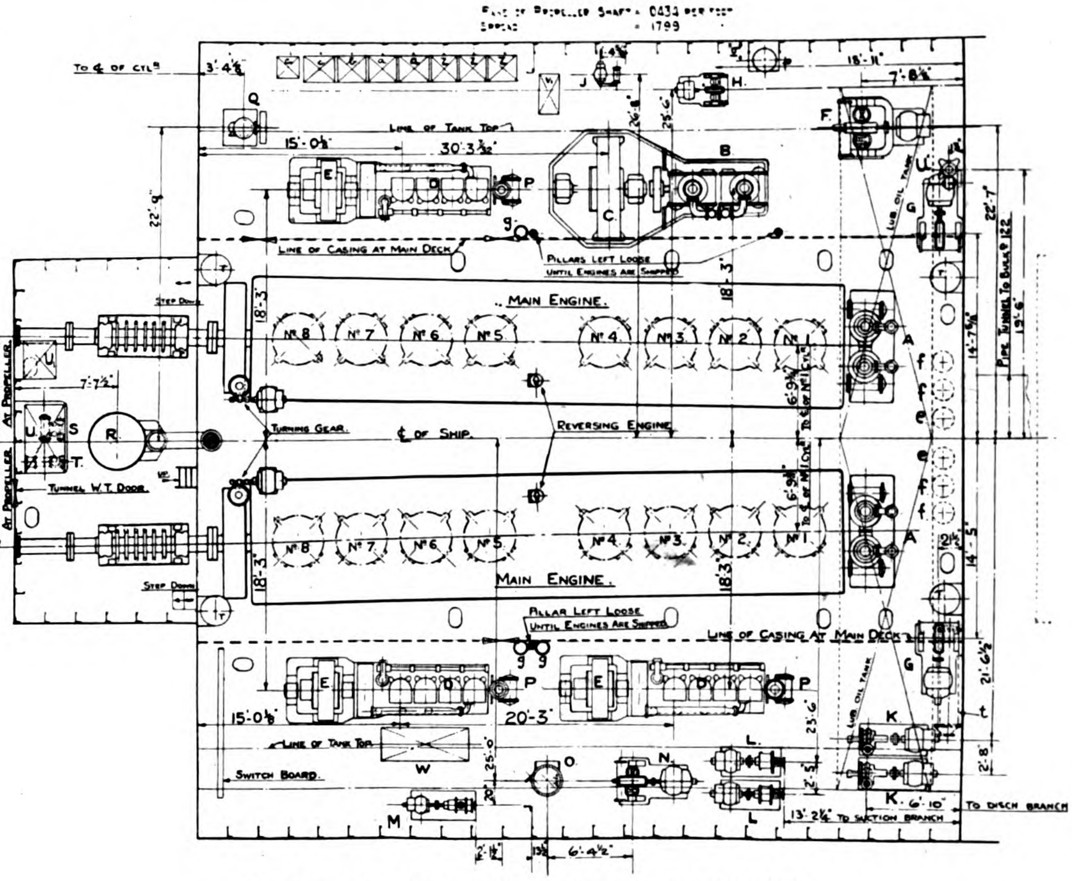
Cross-sections at engine-room of the motorship "HAURAKI"

Number of cylinders—3 in each set
Dia. of H. P. .... 4¼ in.
Dia. of M. P. .... 15 5/16 in.
Dia. of L. P. .... 17½ in.
Capacity per minute .... 250 cubic-feet each
Capacity for 1 main-engine .... 500 cubic-feet each

Auxiliary Machinery

Auxiliary Compressor, electric motor-driven
Number of cylinders .... 3 in each set
Dia. of H. P. .... 3¾ in.
Dia. of M. P. .... 13 9/16 in.
Dia. of L. P. .... 15½ in.
Stroke .... 11¼ in.
Total capacity per min .... 480 cubic-feet in one machine at 1,000 lbs. pressure.
Revs. per min .... 250. Each compressor is a two-crank machine, each crank coupled to a 3-stage compressor.

Steam Emergency-Compressor
Number of Cylinders 2
Dia. of H. P. cylinders .... 2¼ in.
Dia. of L. P. cylinders .... 6½ in.
Stroke .... 6 in.
Capacity per min .... 28 cu. ft. at 900 lbs. pressure
Revs. per minute 350
Pumps—piston cooling (2)
Type .... Centrifugal
Capacity .... 50 tons per hour
Pumps—Cylinder cooling (2)
Type .... Centrifugal
Capacity .... 150 tons per hour
Pumps—Lubricating (2)
Type .... Reciprocating
Capacity .... 50 tons per hour
Pumps—Ballast (1)
Type .... Reciprocating
Capacity .... 200 tons per hour
Pumps—Fuel Supply (1)
Type .... Reciprocating
Capacity .... 15 tons per hour
Pumps—Bilge (1)
Type .... Reciprocating
Capacity .... 50 tons per hour
Pumps—Emergency Bilge (1)
Type .... Centrifugal (submersible)
Capacity .... 50 tons per hour
Pumps—Sanitary (1)
Type .... Centrifugal
Capacity .... 30 tons per hour
Pumps—Fresh Water
Type .... Reciprocating
Capacity .... 5 tons per hour
Oil Purifier (1) "De Laval"
Capacity .... 120 gallons per hour
Starting air Reservoirs—350 lbs. pressure
Four cylindrical tanks .... 5 ft. 9 in. dia.



Engine-room plan of the motorship "HAURAKI"

Total capacity about .... 1520 cu. ft.
Daily fuel-tanks (2) at top of engine-room
Capacity in each .... 12 tons
Lubricating-Oil Tanks in double bottom (2), each with about 12 tons capacity fully.
Settling-Tank for dirty lubricating-oil of 1½ tons capacity.
Donkey-boiler (1), Cochran make, oil-fired
Working pressure .... 100 lbs.
Diameter .... 4 ft. 3 in.
Length 11–0
Evaporization .... 1,100 lbs. per hour
Steering-gear built by Brown Brothers of Edinburgh. Electro Hydraulic and Williams Janney transmission gear.
Windlass—Electric by Clarke Chapman.
Winches—18 MacFarlane Patent, winch drums driven by 11 motors all made by Clarke Chapman

Some motors drive two drums and the other only one drum. Each winch motor is of 35 b.h.p. and is continuous running.

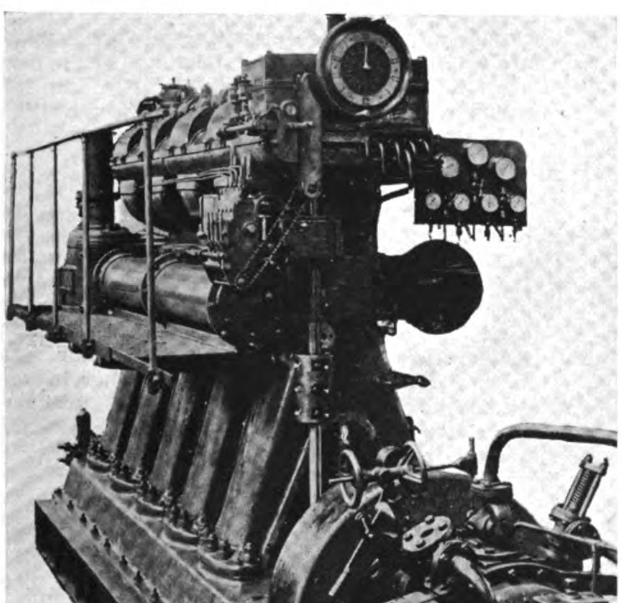
An unusual feature of the engine construction is that the main-engine pistons are of cast-steel with ordinary cast-iron piston-rings. The piston can be withdrawn from the top or below each cylinder. Cylinder covers of the main engine are of box-section, water cooled, and fitted with independent motion, exhaust, fuel, starting and relief valves. All the valves open inward except the fuel-valve which opens outward. The crank-shafts of steel are entirely built-up. Each shaft is in two pieces. The propeller is 3-bladed of bronze. The whole of the machinery is to Lloyds & B.O.T. requirements.

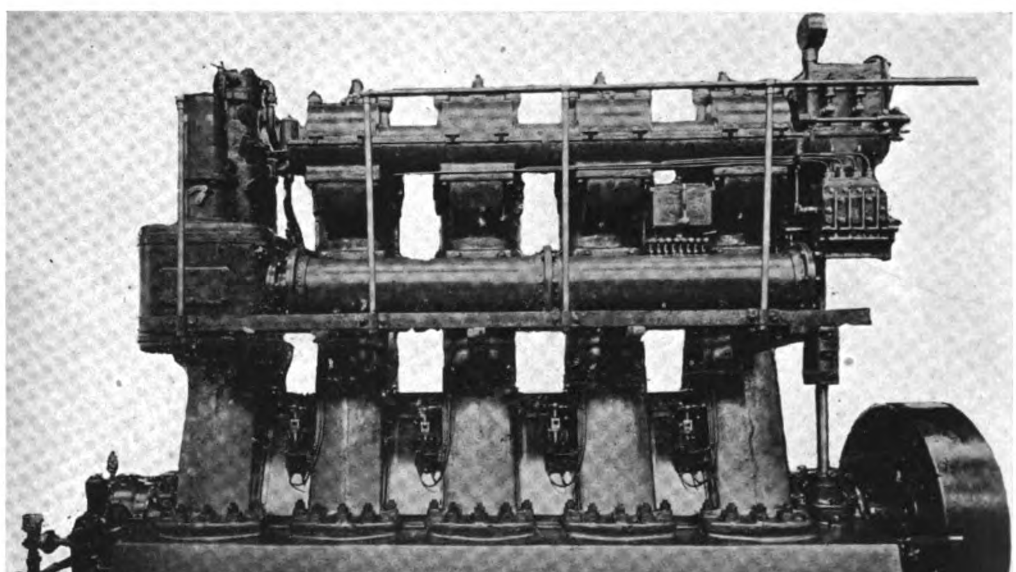
SABATHE DIESEL-ENGINE IN AMERICA

From time to time information regarding the Sabathé Diesel engine has been published in this magazine. It will be remembered that by means of a special system of double fuel-injection whereby combustion is carried-out by means of constant-volume and constant-pressure this engine was the first to obtain a fuel-consumption in practical operation below 0.40 lb. per shaft h.p. hour with high-speed naval types. This was prior to 1914.

The engine in question is constructed by the Societe des Moteurs Chaleassiere of St. Etienne, France and is now represented in the United States by M. Jules Cablet, 280 Broadway, both for the marketing of engines and the disposal of constructional rights. The Sabathé engine has been designed by Mr. Leflaive and M. Bordeulle, formerly engineers of the French Navy and is sometimes known as the Leflaive engine. Mr. Cablet, the new American representative was formerly Minister of Marine of France.

Lately this Company has turned more extended attention to a commercial engine, and designs have been produced in the 2-cycle and 4-cycle types ranging from 75 h.p. to 3,000 shaft h.p.





Two views of a four-cylinder two-cycle Sabathe-Diesel marine-engine built by The Societe des Moteurs Chaleassiere

Heavy Oil-Engined Oyster Dredger

Interesting Tandem Installation of Mianus Motors in a New England Vessel

AFTER their initial prejudice wore away, the fishermen of the New England Coast took—metaphorically speaking—to the gasolene motor like ducklings to water. In a similar manner they have been a little apprehensive in changing to the more economical oil-engine, especially because in these days of abnormal prices the outlay is greater than the cost of the previous change from sail (or steam) to gas. Nevertheless, the obvious success of a number of fishing-craft recently built or converted to Diesel and surface-ignition oil-engines by several progressive owners is awakening their interest, driving away their fears with every indication that there will be a considerable number of boats converted to heavy-oil before the height of next summer's fishing. Many owners intend to take advantage of the period during the winter when some of their craft are laid-up, and thus avoid loss of operating time.

The oyster dredger, "SEA COAST"

Recently we went on a test-trip of the New Haven 91 ft. oyster-dredger "Sea Coast," owned by the Sea Coast Oyster Co. of that port. This vessel was built about six months ago by the Eastern Shipyard Co. of Greenport, and equipped with a 100 b.h.p. gasolene motor. But after a couple of months' service the owners decided to make her more economical in operation, and to increase her speed, inasmuch as the original power-plant could not turn-up the propeller at the designed speed, although rated higher in output than the present twin engines together. The wheel is a Columbian bronze 48-in. dia. by 36-in. pitch and is now turned at 360 R.P.M. giving a speed of 10½ knots, whereas the former motor would only turn this propeller at 270 R.P.M. resulting that a speed of 8 knots only was attained.

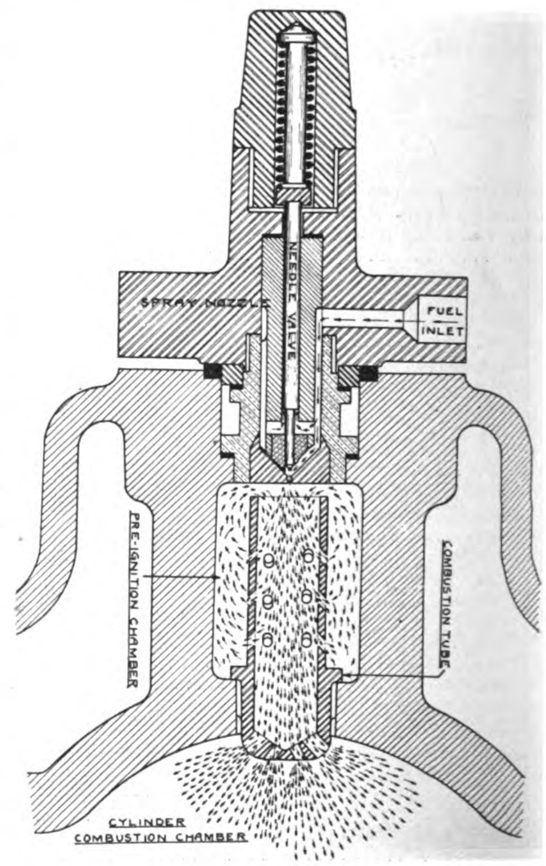
Prior to the conversion the owners of the "Sea Coast" paid $240 per 1000 gallons of gasolene; they now pay $70 per 1000 gallons for Diesel-oil which quantity runs the ship one-third as far, because of the lower fuel-consumption.

The oil-engines were built and installed by the Mianus Motor Works of Stamford, Conn. To avoid structural changes to the hull the twin 40 b.h.p. engines were installed tandem and coupled to the single propeller shaft, which while very unusual in marine practice, is working out very well in this case, particularly as there is not much head-room for a single oil-engine of larger power. Officials from the owners who were aboard during the test trip off New Haven watching the operations of laying buoys and dredging for oysters, expressed themselves to us as being exceedingly pleased with the entire job and its installation.

As is now known, the Mianus oil-engine is made in the U. S. A. under Leissner license and patents by the Mianus Company, and is of the high-compression type with airless—or mechanical—injection of fuel, using a special device to assist the initial combustion when starting, and having both a pre-combustion and a main combustion. Thus the engine is not a Diesel engine or of the surface ignition class.

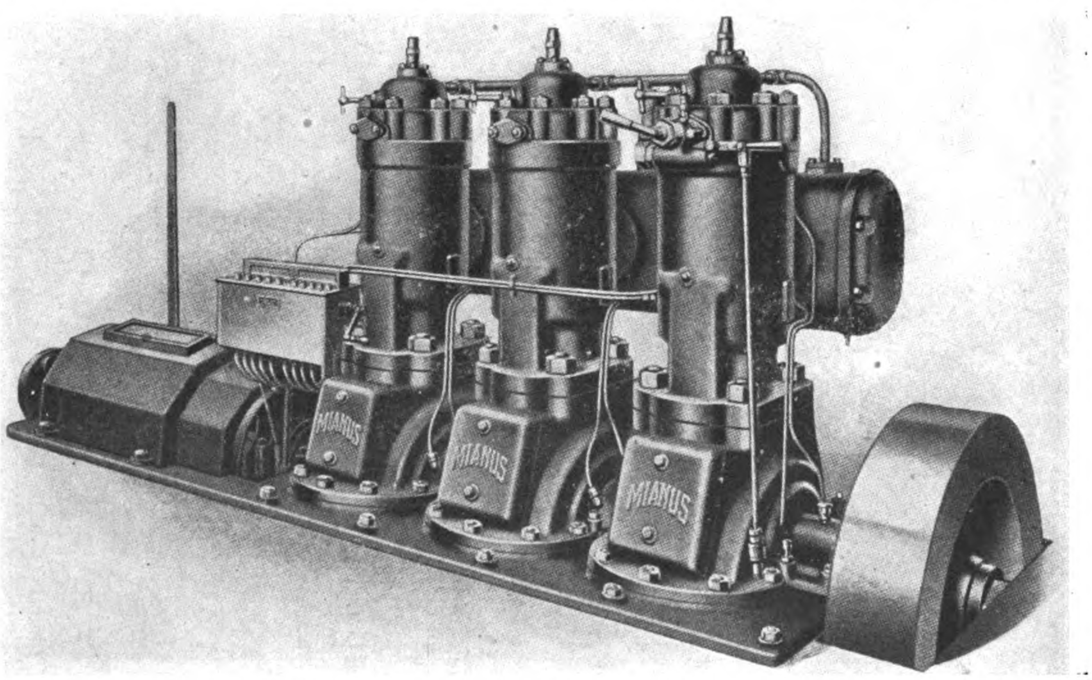
Consequently, a brief description of its system of operation will be of interest. A pump forces the oil at high pressure, via the regulating needle-valve shown in the sketch on this page, into a small chamber in the cylinder-head above the combustion chamber proper, which contains a perforated combustion-tube, and partial combustion occurs in this little space, that by the way is water cooled. The auxiliary igniting device consists of an easily detachable starting-plug that holds a small roll of chemically treated paper that burns with a glow like punk. This ensures starting when the engine is cold.

There is a separate pump for each cylinder arranged at the rear-end of the engine and operated by keyed eccentrics. The pumps supply an amount of fuel slightly in excess of that required, and the amount admitted into the combustion chamber is positively controlled by a cut-off valve which permits exactly the right amount to enter and by-passes the remainder back into the fuel line. The automatic governor operates on these valves, determining with perfect precision the amount of fuel required for any load. Contained in the pre-ignition chamber and directly underneath the spray-nozzle is the combustion-tube, the upper end being open and directly in line with the spray-nozzle. The lower end of the combustion-tube is closed, except for the drilled perforation, which communicates with and projects into the cylinder combustion-chamber directly over the piston. The fuel is led from the fuel-pumps to the spray-nozzles through a small pipe or tubing. When the fuel is compressed in this fuel line to 700 pounds, the pressure overcomes the needle-valve-spring allowing the needle to lift from its seat and spray into the combustion-tube at which time the piston is nearly at the top of its stroke.



Showing principle of fuel-injection and combustion with Mianus-Leissner engines

As a result of this upward piston-stroke, the compression within the cylinder, which is about 450 pounds per square-inch, forces air into the combustion-tube through the small holes in the closed end, thus preventing the oil vapors which are being sprayed into the open end of the combustion tube from entering directly into the cylinder. The mixture within the combustion-tube is too rich to be explosive, but suppressed combustion takes place as soon as the spray starts. A portion of the oil enters through holes inside of combustion-tube into the surrounding pre-ignition chamber, mixing therein with a larger quantity of highly compressed air. Explosion and greatly increased pressure occur within the latter chamber, the gases flowing back into the perforated combustion tube at a temperature of about 2,000 degs. Fahr. gassifying all oil vapors contained therein and discharging them during the down stroke of the piston into the cylinder chamber where they burn as fast as they mix with air.



One of the two three-cylinder 45 b.h.p. Mianus oil engines of the "SEA COAST"

THE "GENERAL PERSHING" SUNK

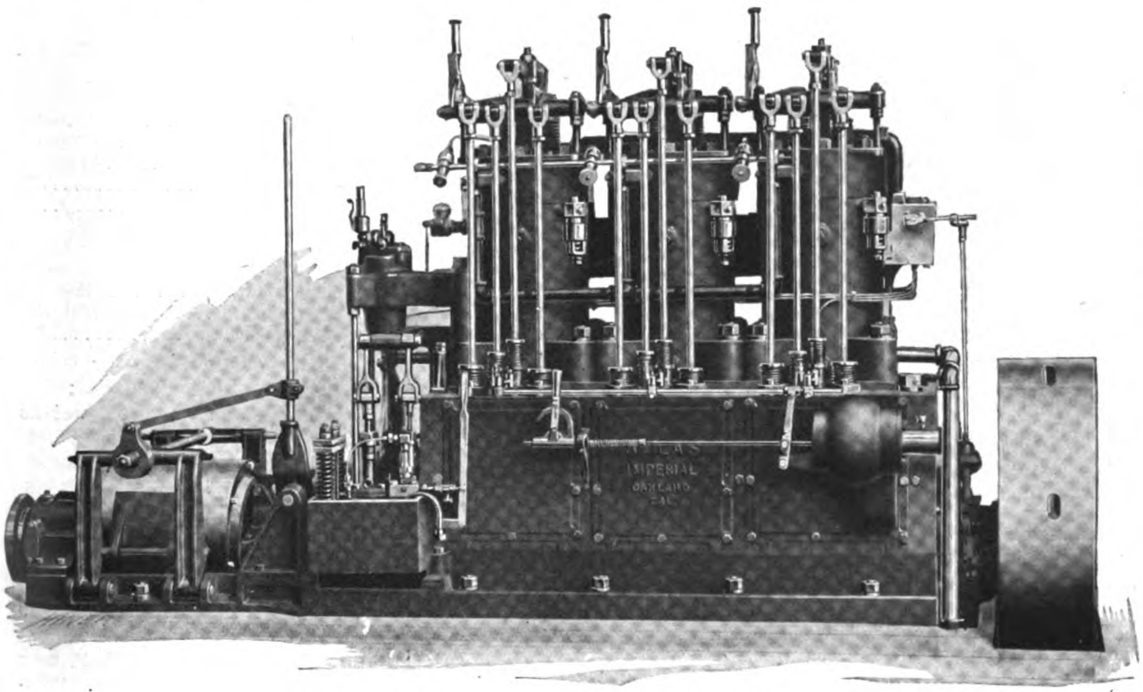
In our Aug. issue (page 645) we referred to the wooden motor-auxiliary "General Pershing" 2,450 tons gross having just been purchased by P. E. Harris & Co., Seattle, Wash., from J. Broch of Trondheim, Norway. She was recently wrecked on Endymion rock en route from Norfolk, Va. to Bremerton, Wash. We presume that the accident occurred prior to her delivery to the purchasers.

Diesel-Engine Construction on the Pacific Coast

Development of the Atlas Diesel Marine Motor—Fourteen Sets Now on Order

When the Diesel-Engine commenced to be extensively adopted for marine work, both in large and small powers, engine-builders on the Pacific Coast were building distillate and gasolene motors of the constant-volume combustion type up to 600 b.h.p. in six cylinders. Seeing that the more economical heavy-oil burning engine was bound to take an important position in the field, several of the more enterprising Western concerns started to develop a Diesel-engine of their own design or else bought a foreign license. Among the former was the Atlas-Imperial Engine Co. of Oakland, Cal., then known as the Atlas Gas Engine Co., who built their first experimental Diesel-engine eight years ago using the well-known air-injection principle, which up to now has been commonly used by the majority of Diesel-engine builders. This experimental engine was the second Diesel-engine to be built on the Pacific Coast. It was eventually sold to the Riley Investment Company of Iditarod, Alaska, for the purpose of running a gold dredger, and was installed in the summer of 1917, where it has been in successful operation ever since.

As a result of the success of this engine a neighboring dredging company also at Iditarod purchased a duplicate of that engine the following season. This engine has also been giving excellent service and Beaton & Donnelley of Iditarod, the owners of the dredger in which the engine is installed, cannot speak too highly of the efficiency, economy, and good running qualities of that machine.



One of the several models of Atlas Diesel marine engines

In February, 1917, the Atlas Co. built and installed a 250-h.p. 6-cylinder Diesel-engine in the ferry-boat "Vashon Island," which goes on record as being the first Diesel equipped ferry-boat in the United States. The success of this engine is well known to readers of "Motorship." She has been in constant operation ever since and has had a record of never losing a trip due to any shortcomings of the machinery. Ferry-boat service is one of the hardest services to which a Diesel-engine can be put, and this ferry-boat has to run thirty days a month all year around, starts early in the morning and does not quit running until long after midnight. A recent letter from Mr. Anderson, superintendent of Transportation for King County, states that up to the present time the engine is running splendidly and giving excellent service, that it is economical, reliable and satisfactory in every respect.

In 1917 the company built four air-injection Diesel-engines for the Bolivia Tin Mine Corporation at Bolivia. These engines are running at an altitude of 12,000 feet above the sea level and have proved very satisfactory. In 1918 they built a 350-h.p. 4-cylinder engine which was installed in Vancouver, B. C., in the "Balan Quesada," formerly the steamer "Zaphiro," which was Dewey's dispatch ship during the Spanish-American War. The dimensions of this vessel are: Length, 213 ft. 7 in.; beam, 32 ft. 6 in.; depth of hold, 21 ft. 3 in. She is a twin-deck vessel built at Aberdeen, Scotland, in 1884. She is now flying the Costa Rican flag. A recent letter from her captain written at the port of New York informed her engine-builders that the engine is performing very satisfactorily and economically.

The same year they also built a 350-h.p. 6-cylinder engine which was installed in the motorship "Apex," then owned by Lee Wakefield & Company of Anacortes, Wash., but we believe is now owned by the Wilson Fisheries. We have been informed that the usual yearly run of that vessel during each fishing season since the engine has been installed has been approximately 30,000 miles and that the vessel has carried approximately 28 cargoes (14 cargoes up to Alaska and 14 cargoes back to Seattle) during each of the five seasons that she has been in service.

In 1917 the Atlas Co. built and installed a Diesel-engine in the tug "Ajax" for Lee Wakefield of Anacortes, Wash. In 1918 they built six Diesel air-injection type engines, which were installed in the three sister-ships "Cap Nord," "Cap Vert" and "Cap Horn." The engines were installed in these vessels at Vancouver, B. C., each vessel being loaded with a million-and-a-half feet of lumber in the North West and proceeded from Vancouver to Liverpool, England, each one of them making splendid runs, arriving in England in good condition and in remarkably short time. These three vessels are now engaged in trade between England and other European countries.

At the time these engines were installed the demand for Atlas-Imperial gas engines had become so great that they found it necessary in order to take care of their old trade to turn their attention exclusively to the manufacturing of the heavy-duty Atlas-Imperial gas-engines in order to satisfy their old customers. For that reason the company did not accept Diesel-engine orders during that busy period. When they finally arrived at the point where they had filled all their long overdue gas-engine orders they were at a practical standstill owing to the Metal Trades strike which was inaugurated all over the Pacific Coast at that time and which lasted for many months.

At the end of the strike they were in the middle of a business depression due to the reconstruction period after the great war. When finally the opportunity offered itself the Atlas Co. set to work and designed an entirely new type engine with the view of creating an engine sufficiently simple that it could be properly operated by the average crew of a fishing-vessel. Having had good experience and success in the building of air-injection Diesel engines, and having had nearly thirty years' experience in designing and building internal-combustion marine and stationary engines, they felt that they were qualified for such an undertaking. The result of their efforts has been the creation of the Atlas Imperial "airless" or solid-injection Diesel-engine which has proven a far greater success than anything the builders had expected it would be.

About six months ago they installed one of the new type solid-injection Diesel-engines of 55 h.p. in the Oakland Launch & Tugboat Company's "Colon." This engine has proven a wonderful success in point of reliability, power, economy, and ease of operation. About three months ago they installed a 4-cylinder 80-h.p. solid-injection Diesel-engine in the passenger-boat "G. W." owned by Garbutt & Walsh of San Pedro, Cal. One of 55 h.p. was shipped about two months ago to a client in the East.

At the present time they are installing two 55-h.p. engines in the freighter "Suisun City" owned by Hunt Hatch Company of Oakland and one 125-h.p. 3-cylinder is being installed in the freighter "Lark" for the same people. One 100-h.p. will be installed the coming week in the tugboat "Halcyon" for the E. V. Rideout Company. One 100-h.p. 3-cylinder engine to be installed in the tug "Panama" for the Oakland Launch & Tugboat Company. One 100-h.p. engine was sold to be delivered to the San Francisco International Fish Company for one of their fishing-tugs. One 55-h.p. engine is now being installed in the halibut schooner "Atlas" at Seattle. Several weeks ago the Atlas Co. received an order for six 80-h.p. engines, and one 100 h.p. engine from one concern. Judging from the amount of inquiries they have at the present time they expect to book at least $100,-000.00 worth of additional orders for their new Diesel-engines before the end of the year.

A recent test of one of the new Atlas 100-h.p. 10½-in. bore 14-in. stroke, solid-injection 4-cycle Diesel-engines showed the following: Pulling 100 brake horsepower load at 230 revolutions, the fuel-consumption was 18¾ horsepower per gallon of crude-oil of approximately 18 degrees specific-gravity; 140 horsepower load was pulled for a number of hours at 250 revolutions; 182 horsepower load was pulled at 325 revolutions. Variation in speed when throwing the clutch in-and-out from no load to 125 h.p., less than 1½%. Lubricating-oil used, one gallon per twelve hours' work. Starting of engine as easy as starting a steam-engine. Using compressed-air it required 100 lbs. or over when the engine was cold, but after the engine was warmed up it started on 30 lbs. air-pressure.

The arrival of the little vessel "Suisun City" at the wharf of the Atlas Imperial Engine Company on Sept. 26th under her own power marks an epoch in heavy-duty gasoline-engine industry. The "Suisun City" was powered with a pair of 65-h.p. heavy-duty gas engines functioning perfectly, and driving the boat at good speed. These two reliable engines are now rusting in the warehouse and are offered for sale at $750.00 each; and there are now being installed in the "Suisun City" two 55-h.p. Atlas-Imperial airless-injection Diesel-engines. The two 55-h.p. Diesels will give greater actual power than the two 65-h.p. gas-engines, with a big fuel-bill saving.

FEBRUARY AND MARCH COPIES WANTED

If any subscriber has a copy of February and March, 1921, that he can spare we will be glad if he will send same to Mr. A. Sybrant, 153 Rokin, Amsterdam, Holland, but first advise us, we will send stamps for mailage. Mr. Sybrant's copies were lost in the mail, and we are completely sold-out of those numbers.

AUXILIARY SCHOONER "MAGDALEN VINNEN"

Now building at Krupps, Kiel, Germany, is the 5,200 tons d.w.c. auxiliary bark "Magdalen Vinnen." She is 323 ft. long by 48½ ft. breadth and 24½ ft. draught. She has a single 500 b.h.p. submarine-type Diesel engine installed. Her canvas area is 3,392 sq. meters.

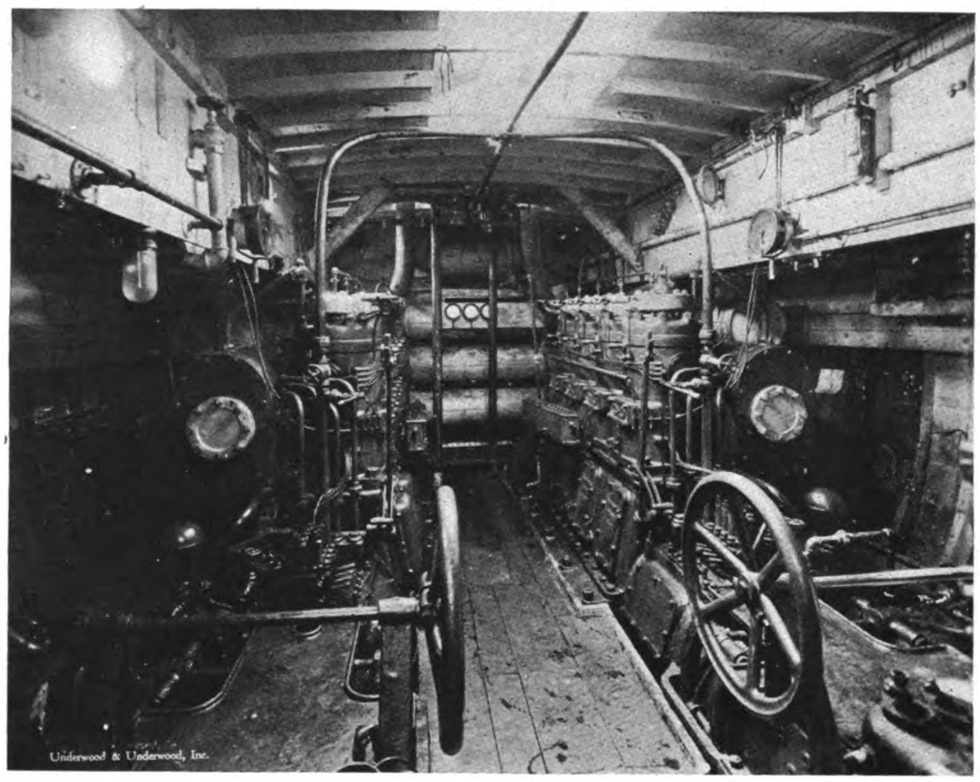
Utilizing Sub-Chasers for Commercial Work

Conversion of One of the U. S. Navy's 110-Footers Into a Lobster Carrier

FOLLOWING the war a wholesale scrapping of out-of-date war-craft, together with a number of minor naval-boats that were built for special purposes, took place. Quite a number of vessels were converted into motorships, including destroyers, submarines and even battleships, although to our mind the conversion of the last-named class of ship is not an economy judging by the results of such installations recently carried-out in Germany. The same does not apply to the big fleet of 110-ft. submarine-chasers constructed for the U. S. Navy, most of which craft have been sold by the Navy Department to private-owners for use in commercial work. One Philadelphia firm purchased about a couple hundred of these boats for re-disposal, and we understand have already successfully marketed a number of them. Some have been converted into fast fish-carriers, passenger-craft, pilot-boats, and pleasure craft. To these uses these former war-craft are admirably suited, often with but slight alteration. That they are very seaworthy and staunchly built none need be told who know their war record on the European, as well as on our own, coasts. In view of the possibilities offered by these trim little craft we believe that our readers will be interested in reading about the "Corona," owned by Frank E. Davis, of San Diego, Cal.

The converted sub-chaser "CORONA"

In the early summer of 1921 Mr. Davis contracted with the Liberty Dry Dock and Repair Co. of Brooklyn, N. Y., to make the necessary changes and install two surface-ignition type oil-engines, which work was done under the personal supervision of the owner, with a manufacturer's engineer assisting in the machinery installation. Fortunately for those making such changes in machinery there is a portable section of the cabin-house over the entire length of the engine-room. After her trials the "Corona" made a trip from New York via the Panama Canal to San Diego, in very good time, where she now operates as a fast lobster-carrier. In converting this boat to her present use, the original three 220-h.p. 6-cylinder 10 in. by 11 in. single-acting gasoline-engines were removed and in place of the two wing engines, after rebuilding the beds to suit, two 100-h.p. 4-cylinder 10½-in. x 12½ in. Fairbanks Morse engines were installed. As these two engines occupy practically the same amount of space as the former wing engines there is ample access to all parts of the machinery, and the various engine-room auxiliaries such as the Standard gasoline-engine driving a 4½-k.w. electric generating-set, air-compressor, bilge, fire, and "handy billy"-pumps, the electric ventilating-blowers, the engine-room telegraph system, air-tanks, etc., were not disturbed.

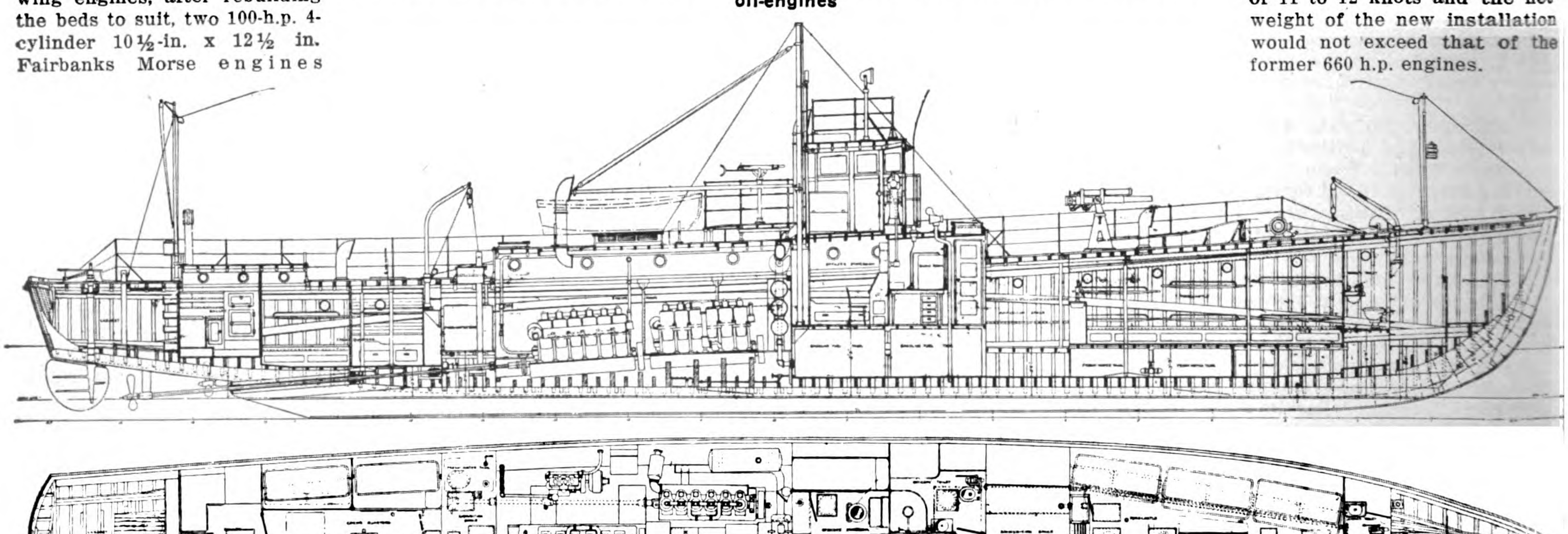


Engine-room of converted sub-chaser "CORONA," showing her two Fairbanks-Morse oil-engines

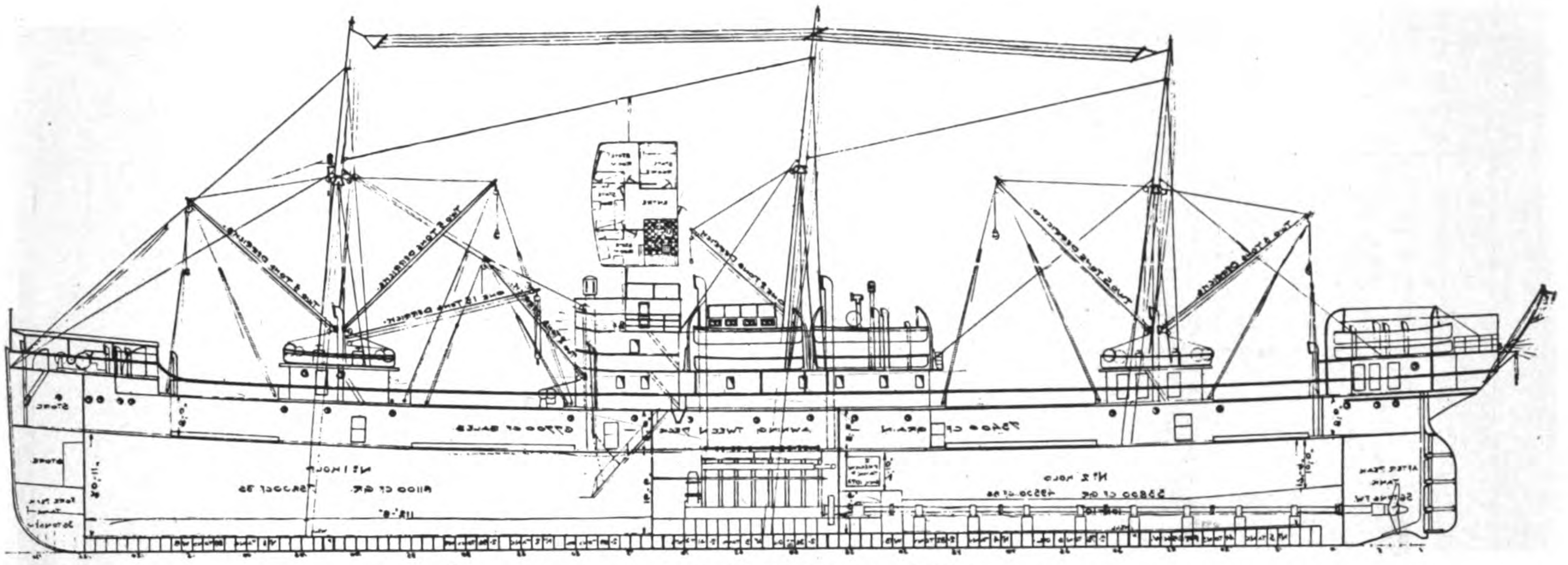
From the plans it will be noted that the space formerly occupied by the center engine is available for free passage back-and-forth by the engineers, as no center engine is now installed. The original fuel-tanks with a capacity of about 2,400 gallons of fuel-oil give the "Corona" a radius on one fueling of about 2,000 miles at a maximum speed of 15 knots propelled by two Columbian bronze propellers of 39 inches diameter, 58 inches pitch with three broad-tip blades turning at about 340 r.p.m. The engine manufacturers advise that on the trip to her home port the "Corona" used Gulf 28° Baumé fuel-oil costing 4½ cents per gallon, and that the fuel-consumption was about 16 gallons per hour at maximum speed, which is equivalent to a fuel-consumption of 0.60 pound per brake horsepower-hour. The general dimensions and characteristics of the "Corona" are as follows:

Length over-all	110 ft.
Breadth over planking	14 ft. 8¾ in.
Depth at side	8 ft. 8 in.
Draft, extreme	5 ft. 4 in.
Freeboard, least	4 ft. 4 in.
Tons, register	79
Tons, net	13
Displacement (light)	65 tons
Fuel capacity	8 tons, about
Cruising radius	2,000 miles, about
Speed, maximum	15 knots
Speed, normal	13.8 knots
Horse-power	200

The original power plant wieghed about 9½ tons; but the present plant weighs about 18 tons. Much of this increased weight over that of the original installation is offset by the removal of many tons of equipment and parts of the structure and interior work which are not needed in the boat for present use, so that the net increase in light displacement of the boat over formerly is not so great. However, for commercial use two 60-h.p. oil-engines should drive one of these boats at a speed of 11 to 12 knots and the net-weight of the new installation would not exceed that of the former 660 h.p. engines.



Plans of the U. S. Navy's submarine-chaser, showing arrangements prior to conversion



Plans of the East Asiatic Co.'s new 3,500 tonner

New 3,500 Tons Motorship for East Asiatic Co.

It stands forever to the credit of the East Asiatic Co. to have first backed their faith in the large motorship for the long routes, having first secured cheap-fuel contracts at the principal ports of call. Since the inauguration of the m. s. "Selandia" this concern has continuously increased the size of their Diesel-driven vessels, the 13,500 tons "Afrika" class being the last milestone. But for the present universally bad shipping conditions the construction of a number of 15,000 tons deadweight motorships would not have been postponed. In this development the owners have worked hand-in-hand with the Burmeister & Wain shipyard, and it has already been recorded how this latter concern has not rested, but together with the Götaverken recently introduced a new long-stroke motor for single-screw vessels.

With their unrivaled experience of operating the largest motorship fleet, the East Asiatic Company are also in the front rank with regard to acquiring medium-sized and small motorships. This policy was first embarked upon with the twin-screw 4,450 tons motor-tanker "Mexico", the successful operation of which has repeatedly been recorded in these pages.

The East Asiatic Co. now has building at the Nakskov Yard, Denmark (in which it is financially interested) the 350 b.h.p. Holeby-engined single-screw 1,000 tons motorship "Virginia", which is designed for Baltic or alternatively tropical trade. This vessel has been completed ahead of the yard No. 4 ship for the same owners, which will be a 3,500 tons Burmeister & Wain-engined motorship. Could the war time delay in getting materials have been foreseen, it is likely that Holeby Diesel-engines similar to those of 800 i.h.p. in the m.s. "Mexico" would have been installed in the 3,500 tonner, as the East Asiatic Co. is also interested in the builders of this engine, namely, the Holeby Diesel Motor Works.

The Nakskov "No. 4" is an awning-deck twin-screw vessel of the following dimensions; length 284 ft., beam 44 ft., depth 19½ ft. The grand total cargo-capacity amounts to 193,000 cu. ft. bales, or 203,000 cu. ft. grain, in two holds and in the awning 'tween deck.

Four hatches are provided, two being of the dimensions: 30 ft. 4 in. by 16 ft., the forward one: 21 ft. 8 in. by 14 ft., the aft: 19½ by 14 ft.

The vessel is fitted with 3 masts and equipped with 12 derricks, of which four are of 5 tons lifting capacity at the fore and aft masts, one of 15 tons at the foremast, two of two-tons at the kingpost, and a third of similar capacity at the main mast. The derricks are served by four 5-tons and one 1½-ton winches, mounted on the deck-houses and by two 1½-ton winches arranged on the main deck, all being electrically driven like the windlass. The fifth 3-ton winch with extended pulleys for warping purposes is fitted aft, ahead of the steering-gear.

The engine installation comprises two of Burmeister & Wain's four-cycle type marine Diesel-engines of 900 i.h.p. each, and three 2-cylinder 75 h.p. auxiliaries driving generators and with the usual electric drive of the stand-by compressor and of the various pumps. The engine-room takes up 14 frames. As usual no funnel is provided. At the time of writing the fitting-out has not been definitely settled upon. On the flying bridge are three state-rooms, presumably for the captain and a few passengers. The vessel is to be run in the Siamese coast service, which is a great compliment to the faith placed in the reliability of the motorship, as facilities for proper overhauls are not available, whereas the big motorships occasionally call on the home port.

CHARGEURS REUNIS' NEW MOTORSHIP "CAMRANH"

Prior to publication elsewhere, "Motorship" announced about a year ago that a big Sulzer-Diesel-driven vessel was to be built for the Chargeurs Reunis of Paris, France, at the Chantiers de la Loire's Nantes Shipyard. This motorship is named "Camranh," and has the following dimensions—

Loaded displacement	17,100 tons
Light displacement	5,400 tons
Net cargo capacity	10,000 tons
Cubic capacity of holds	18,000 cu. meters
Dead-weight-capacity	11,700 tons
Power	3,400 h. p.
Length (O.A.)	143.00 meters
Length (B.P.)	137.00 meters
Breadth (M.D.)	18.00 meters
Depth (M.D.)	12.18 meters
Draught (mean loaded)	8.92 meters
Length of machinery-space	16.00 meters
Propeller dia. and Pitch	5.10 meter x 4.50 meters

For propelling power twin two-cycle type Sulzer Diesel-engines are installed. Each develops 1,700 h.p. from four-cylinders, 680 mm. (26.771) bore by 1,200 mm. (47.244) stroke at about 100 R.P.M. The machinery space is only 52 ft. long. All the deck and engine room auxiliary machinery is electrically driven, current being supplied by several Sulzer Diesel-driven generators.

SPLENDID PERFORMANCE OF THE MOTOR TANKER "NARRAGANSETT"

We draw attention of American oil-companies to the performance to-date of the 10,050 tons Vickers Diesel-engined motor-tanker "Narragansett." It is noteworthy that after over a year's service her mean-speed is increasing, while her fuel-consumption is less than ever. The following is a resume.

	Average of first 14 Atlantic Crossings	Average of first 16 Atlantic Crossings	Average of first 17 Atlantic Crossings
Total distance	45,025 mi.	56,303 mi.	60,946 mi.
Mean speed	10.17 knots	10.29 knots	10.33 knots
Daily engine consumption	9.90 tons	9.82 tons	9.84 tons

This vessel, together with the sister motorship "Seminole," is owned by the Anglo-American Oil Co.

MORE WARSHIPS TO BE CONVERTED TO DIESEL MOTORSHIPS

The owners of the German ex-cruiser "Odin," now a Diesel-driven motorship, have purchased three more vessels of this class and will convert them to motor-power. It may be remembered that the "Odin" was described in a recent issue of "Motorship."

BOOK REVIEWS

Ocean Shipping, by Erich W. Zimmerman, Ph.B., Professor of Commerce, James Milliken University, Decatur, Ill., U. S. A. Published by Prentice-Hall, Inc., New York. Price, $4.00. Undoubtedly one of the most complete and authoritative volumes dealing with the timely subject of ocean transportation with its many attendant problems is this comprehensive book by Professor Zimmerman, which has only recently come from the press. It has, therefore, been possible for the author to deal in an interesting manner with the particular problems and developments growing out of the war. Recent legislation, shipping combines and agreements, charters, rates, organization, insurance, classification, oil and coal bunkering, principles of construction, handling and stowage of cargo, port terminals, etc. are covered in considerable detail, a large number of the most up-to-the-minute references contributing to this feature of this book of 30 chapters. The motorship with its past history, present success and future development are dealt with at some length in Chapter VIII. None can read this book without having it impressed very forcibly on his mind that the motorship is here to stay and is fitted in every way to carry the world's commerce.

"Mex. Fuel-Oil"—Issued by the Anglo-Mexican Petroleum Company, London and New York. Price £10-6-0 net. This is the second edition of a book published under the same title in 1914 in English, Spanish and Portuguese. It is a semi-technical review of all the different industries in which fuel-oil is used. A section is devoted to marine Diesel and surface-ignition types. In it are given illustrative descriptions of six well-known engines of each class, as well as descriptions of a number of stationary Diesel-engines. In the appendix there is a list of 75 manufacturers of Diesel and surface-ignition engines. We are sorry to note that throughout the book the term "semi-Diesel" is used instead of surface-ignition. England seems to be the only country that is still retaining the word "semi-Diesel" in its technical vocabulary. In the United States and the majority of other countries the term "surface-ignition" has been standardized, which name incidentally, was first started in England. The term "semi-Diesel" indicates and means nothing, and the sooner it disappears the better it will be.

OUR REGISTRY OF MOTORSHIPS' ENGINEERS

Mr. R. A. Meyer, 918 Oak St., Oakland, Calif., 7 years' experience with hot-bulb and Diesel engines, chief on four motor-vessels, and two Diesel-electric power plants.

VINCENT ASTOR
Nº 23 WEST 26TH STREET

New York, September 23rd, 1921.

T. Orchard Lisle, Esq.,
Editor, "Motorship",
282 West 25th Street,
New York, N. Y.

My dear Mr. Lisle:

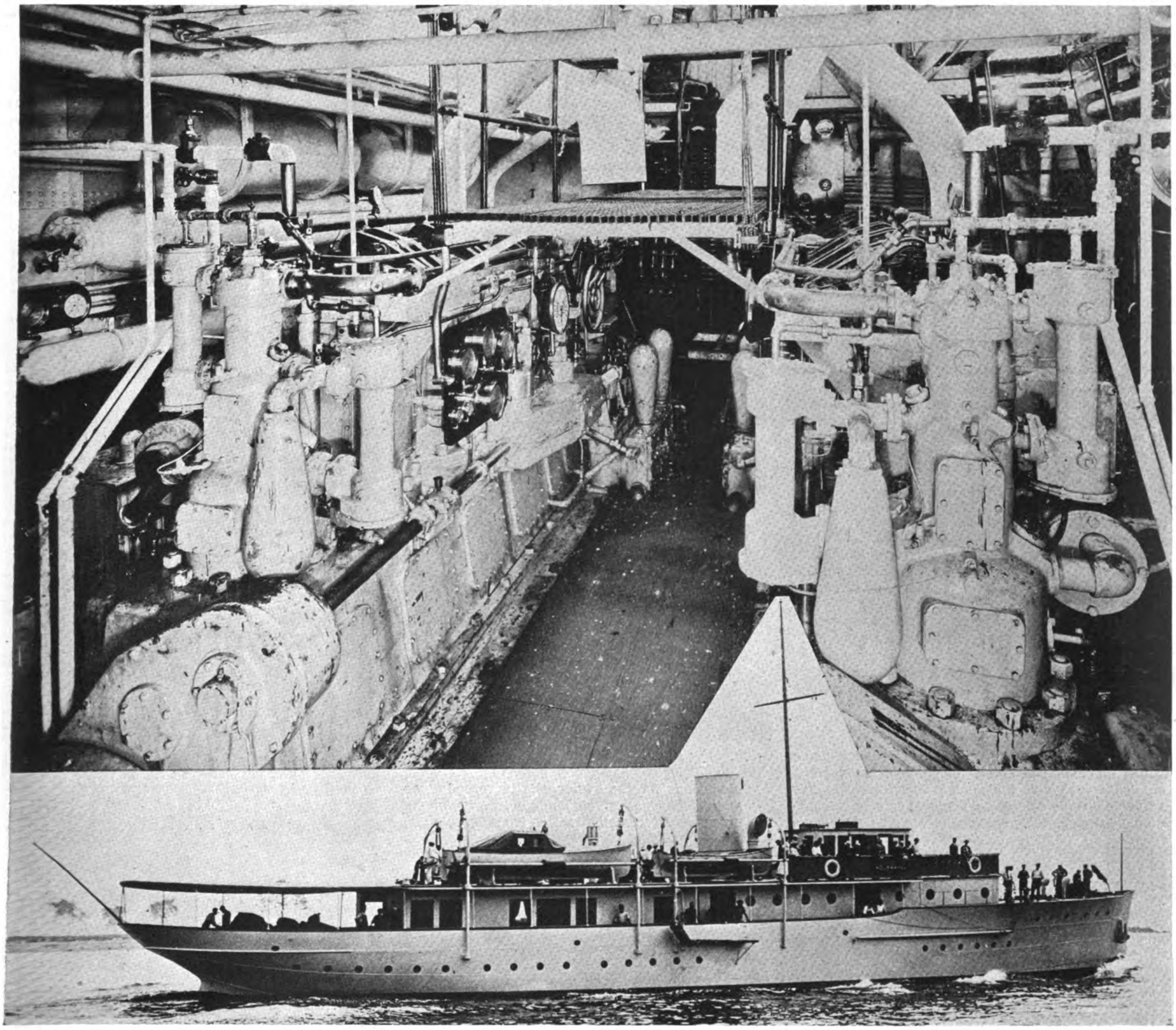
In answer to your letter of September 21st, it may interest you to know that "Motorship" was to some extent instrumental in influencing me to adopt full Diesel type of propelling machinery in my new yacht, for your magazine brought the subject largely to my attention.

You will, I am sure, be glad to know that the machinery of the ship to date has been successful in every way, and operates to my entire satisfaction. In economy of operation, it is, of course, incomparable to any type of power plant.

Yours very truly,

Vincent Astor

VA:SW



Above—Engine-room of Vincent Astor's new yacht "Nourmahal" showing twin Winton Diesel motors similar to engines used in conjunction with Westinghouse electric-drive for merchant ships. Below—The "Nourmahal"

NEW TYPE OF OIL-ENGINED FISHING VESSEL

A year or more ago one of our subscribers walked into our office and said that he was going to build a new type of oil-engined fishing vessel, which he called an "ocean-harvester," with the idea of catching, packing and refrigerating 600 tons of fish every 24 hours. This man was the late Captain Niels A. Lybeck of the little hamlet of Lybeck, Fla.

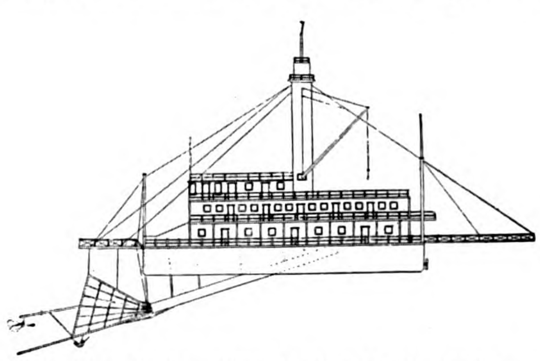
His novel vessel was launched in the spring, and recently ran preliminary tests. She is propelled and operated by three 75 b.h.p. Dodge Hvid-Brons type oil-engines and has the following dimensions—

Displacement	400 tons
Length	104 ft.
Breadth	50 ft.
Power	225 b.h.p.

On trials the power was found too low, so the owners are figuring on Nelseco Diesel-engines aggregating 1,000 shaft h.p.

As will be realized from the sketch she is a freak vessel. Whether she will be practical or unsuccessful will be known a few months after she has been in service. She has been named the "Liberator." Even presuming the vessel was successful as a trawler, another problem will face the operators; namely, the marketing of such large quantities of fish when caught and landed.

The boat has complete lay-out and equipment for receiving, sorting, packing and refrigerating fish, machinery for stripping-off skin and extracting oils, for electrolysis and dehydrating, facilities for recovering out of the scrap, every particle useful in the manufacture of glue, soap, cooking-fats, paint, stock-food and fertilizer, and reducing these to least bulk, and to the best conditions for handling or further conditioning. Conveyors carry the materials to each required operation,



Sketch of the oil-engined ocean-harvester "Liberator"

then to the most convenient point for unloading. A seaplane is to be used for locating fish.

The net which is 50 feet wide and 20 feet deep, is held forward of the boat, supported by cables attached to counter-balances that work up and down the hollow masts. The idea of the designer is that the forward movement of the vessel will force fish of any and all sizes back to the throat of the large steel net, when they land on an endless conveyor. Whales, sharks, etc., that are too large for the opening are cut up by knives before being conveyed to the deck. At night the harvester's searchlights are to be employed as a means of attracting fish into the path of the oncoming vessel.

DIESEL-ELECTRIC DRIVE FOR NEW YACHT CRUISER "RUENDA"

With reference to the illustration of the Diesel-electric drive set for the cruiser "Ruenda" illustrated in our September issue, we have just been advised that her machinery was ready and accepted, but owing to the Russian Naval authorities having taken so long to come to a decision regarding this old vessel she was scrapped in the meantime. The engines and electric generators were then used on land at Sabastopol for the purpose of charging storage-batteries of submarines.

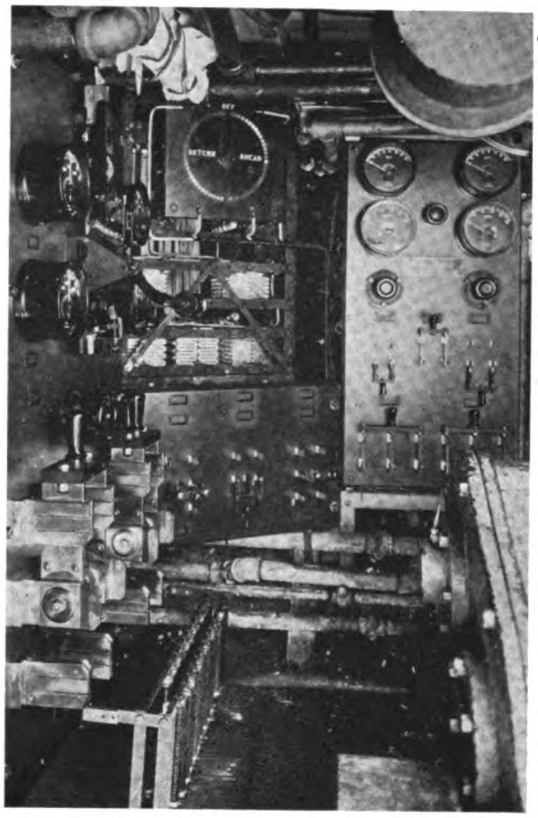
Diesel-Electric Auxiliary "Guinevere"

Interesting Installation of This Much-Discussed System of Propulsion in Edgar Palmer's Big Yacht, Equipped with Winton-Westinghouse Machinery

LATELY the size of motor-yachts has increased to such an extent that they are fast taking the place of palatial steam-driven private-craft, and are of a size equal to many coastwise merchant-ships. That remarkable space and fuel saver, the Diesel oil-engine, has recently been finding favor with owners of such craft, and the installations in these vessels have become of engineering importance on a par with commercial ships.

Consequently, Edgar Palmer's new big auxiliary "Guinevere" should interest "Motorship" readers from this viewpoint and not because of her beautiful form and palatial accommodations. She is noteworthy because of her complete oil-engine driven electrical equipment, the most comprehensive yet installed in a boat of her size. Other Diesel-electric vessels have been dealt with in the pages of "Motorship," but, from the stand-point of the electrical-engineer this big yacht stands alone as a record of achievement along the lines of a complete electric ship. Not only is she propelled by electricity generated by Diesel-driven generators, but electricity handles all cooking, heating, anchor, boat and sail hoisting, steering, making ice, driving pumps for washing decks, pumping bilges, fighting fire, operating gyro stabilizer and compasses, vacuum cleaner, laundry machines, ship's telephones, ventilating-fans, searchlights, rudder and propeller direction indicators, wireless telegraph, etc. No steam or other power is utilized.

Mr. Palmer's former yacht of the same name, which was lost in naval service during the war, was approximately the same design and size, but was propelled by a 700 h.p. quadruple-expansion steam-engine and Scotch boiler, making necessary a smoke-stack which not only occupied valuable space, but created dirt and heat on deck. In the new boat the space formerly taken up by the stack is given over to a comfortable deck-house while the exhausts from the engines are carried out below water at the stern. These features are valuable in any vessel carrying guests or passengers. Likewise of great value are the added accommodations for the owner, the increased storeroom, the decrease of six men in the crew, and the increase in cruising-radius from 4,000 miles with 160 tons of coal to 11,000 miles with 95 tons of oil. It is unnecessary to enlarge upon the convenience of telephones, lights, fans, toasters, etc.



Main control board and direction indicator

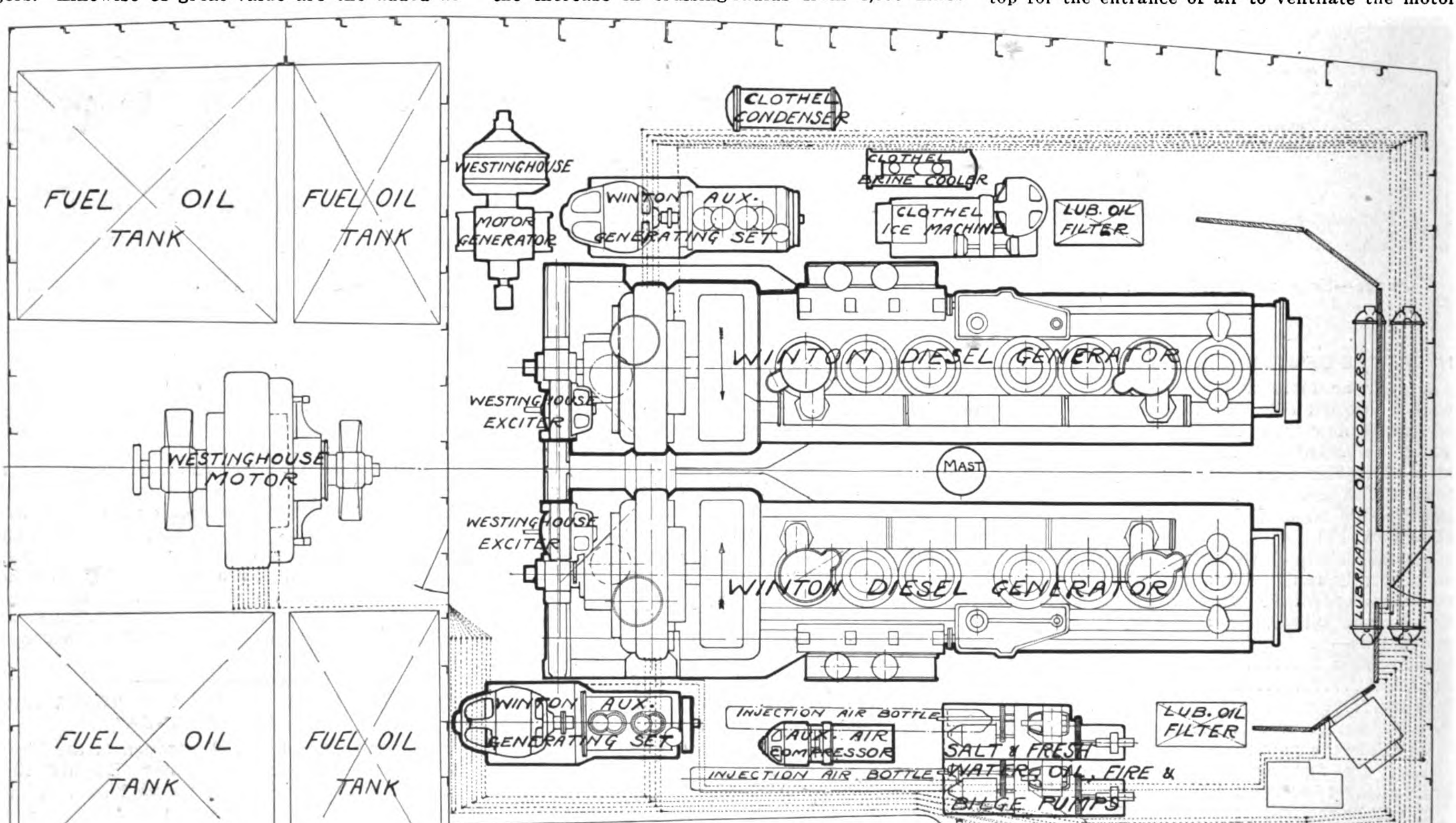
The principal characteristics of the "Guinevere" are as follows—

Construction	Steel
Length overall	195 ft.
Length water line	150 ft.
Breadth, molded	32 ft. 5 in.
Draft	15 ft.
Displacement	642 tons
Speed under power	11.35 knots
Horse-power main Diesel-engines	700
Power of elec. generators	450 k.w.
Power of propelling motor	550 h.p.

Designed by A. Loring Swasey, naval-architect of Taunton, Mass. and built by George Lawley & Son Corp. at Neponset (Boston) Mass. for Edgar Palmer of New York, the "Guinevere" represents the best of a new era in big yacht building and the co-operation of the Winton Engine Works and the Westinghouse Electric & Manufacturing Co., assured the success of this largest of Diesel-electric yachts.

We illustrate, herewith, the general arrangement of the "Guinevere's" engine-room, in which are found two 6 cylinder 13 in. by 18 in. 350 h.p. Winton Diesel-engines operating at 225 R.P.M., each engine direct-connected to a 225 KW 125 volt Westinghouse shunt-wound generator, each operating by chain-drive a 15 KW 125 volt direct-current compound-wound Westinghouse exciter turning at 1150 R.P.M. This power supplies current to the 550 h.p. 250 volt Westinghouse electric-motor operating at 220 R.P.M. located aft of the main engine, the motor being direct-connected by a flange-coupling to the propeller-shaft, which drives a 2-blade 8 ft. 4 in. diameter Bevis propeller. In the engine-room is an electrically-operated indicator giving R.P.M., total revolutions, also ahead and astern directions.

All the electrical equipment is designed with special reference to marine use, being very rugged and with windings specially insulated and impregnated against moisture, non-corrodible material being utilized wherever possible. In order to provide for efficient lubrication of the pedestal bearings of the generators when the vessel lists to one side not only ring-oilers are used, but special provision is made to flood them continuously with oil from the oiling system of the Diesel-engine. Also this bearing is placed relatively low down. The bearings of the motor are of the pedestal type, not only ring-oiled but flooded with oil under pressure by means of pump geared to the motor-shaft. The exciters are ball-bearing. The main motor is enclosed at the forward end with an inlet at the top for the entrance of air to ventilate the motor,



Engine-room arrangements of the "GUINEVERE" showing main and auxiliary machinery

this air being driven by a centrifugal-fan direct connected to a 1¾ h.p. motor of 3,500 cubic-feet per minute capacity.

On each side of the vessel abreast the driving motor are the fuel-oil tanks holding about 19,500 gallons. Outboard of the aft end of each Winton Diesel-generating set is an auxiliary 15 KW 115 volt electric generating-set driven by a 25 h.p. Quayle surface-ignition oil-engine operating at 600 R.P.M. At the aft end of the engine-room on the port side is a 125 volt 45 KW Westinghouse motor-generator. Forward of the auxiliary generating-set on the port side is the 2-ton Clothel refrigerating-set consisting of ice-machine, brine cooler and condenser, driven by a 10 h.p. electric-motor of 115 volts, this set cooling the cold-storage rooms located under the crew's quarters and galley.

Operated by 115 volt 5 h.p. electric-motors are the Kinney oil-transfer, fire and bilge pumps, while 1 h.p. 115 volt electric-motors operate Kinney sanitary, salt and fresh water-pumps; the circulating water-pump is handled by a ½ h.p. 115 volt electric-motor, while a Ramsey vertical centrifugal sump-pump is operated by a 1 h.p. 110 volt electric-motor. Sturtevant ventilating fans are driven by a 1 h.p. 125 volt motor. For charging the air-bottles a Winton 12 h.p. 125 volt air-compressor is provided.

Cooking facilities are all of 110 volts, and are very complete, the electric-ranges, hot-water heaters, broilers and warming closets in both owner's and crew's galley being furnished by Duparquet, Huot, and Moneuse, coffee and hot-water urn by Morandi-Proctor. A laundry containing 115 volt mangle, washing-machine and extractor will be found useful on the long cruises. Most complete electric-lighting is provided, consisting of 200 25 watt 110 volt lamps and two 18 inch Sperry high-intensity searchlights throwing a very powerful beam and operating on 110 volts, these searchlights being mounted on the navigating bridge.

On this bridge, at each end from which the vessel is entirely controlled, is an operating station, consisting of steering-wheel connected with a highly-developed electric steering-control which operates the Lawley 10 h.p. 115-volt electric steering-gear aft, a magnetic compass, Sperry repeater gyro-compass, Sperry helm-angle indicator showing every movement of the rudder, and telegraph to engine-room. In the "Elfay" (a somewhat similar schooner yacht owned by Russell A. Alger, also powered with Winton Diesel-Westinghouse-electric drive, which has been run over 14,000 miles without any machinery trouble whatsoever), the control of the propelling-motor is on deck beside the wheel, whereas in the "Guinevere" all these controls are in the engine-room.

In addition to the repeater compasses on the bridge, repeaters are found in the owner's stateroom as well as in the various parts of the ship, operated by the master gyro-compass, which also runs an electric-log giving actual speed, desired speed, trip mileage, average propeller revolutions and making a permanent record on graph paper showing exact compass courses maintained over a period of one month. Also there is a dead-reckoning equipment, known in the Navy as a "bug," which travels over a chart, following every movement of the direction of the vessel, being operated for direction by the master gyro-compass and for speed by the electric log.

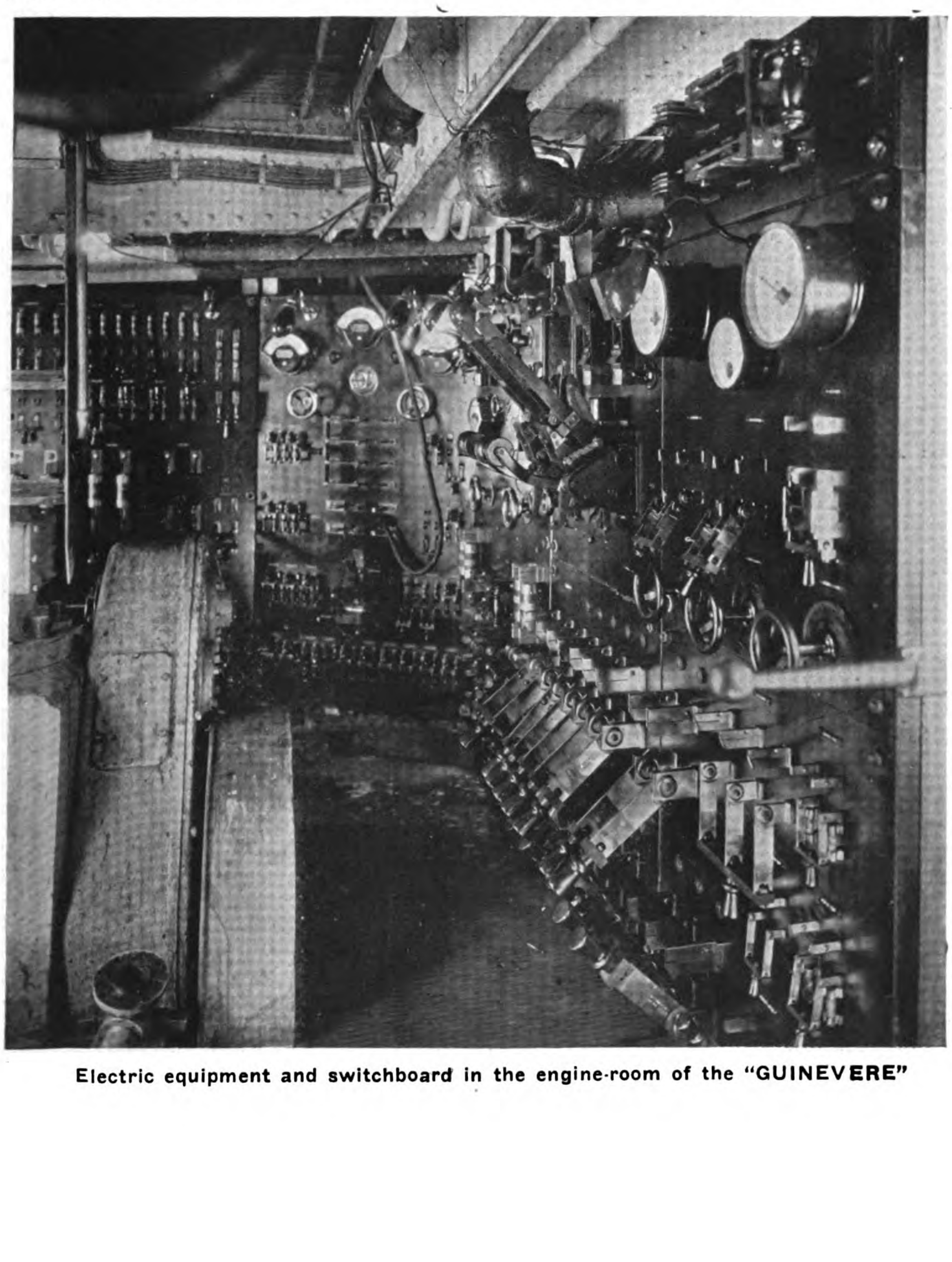
Edgar Palmer's Diesel-electric driven auxiliary "GUINEVERE"

A small Sperry Gyro operates a roll-and-pitch recorder equivalent to a pendulum 2,000 yards in height and with period of 70 seconds, which traces very accurate curves of roll and pitch of ship. One item of equipment which will be greatly appreciated is the Sperry gyro-stabilizer, having rotor 6 ft. in diameter revolving at 1700 R.P.M., reducing the rolling and motion of the vessel to only 2 or 3 degrees each side, adding to the comfort and enjoyment of those aboard as well as reducing the fuel-consumption and increasing the cruising radius.

The Wireless Specialty Apparatus Co. of Boston furnished a 3 KW wireless-outfit having a range of 1,000 miles. This set has remote control which is handled on apparatus in the chart-room from which messages are received or sent, the transmitter being installed in the engine-room. In view of the large amount of electrical apparatus in that room the 100 cells of Edison 115 volts 800 ampere-hour batteries are installed on deck in a special box removing any danger in case of gases forming. On deck are also 8 h.p. 115 volt electric-motors operating hoists at the small launch and boat davits and at masts for hoisting sails, and a Hyde windlass is operated by a 20 h.p. 110 volt electric-motor.

For normal operation at full power, the two main generators are connected in series, furnishing power to the motor. The generators and motor are arranged for separate excitation at 125 volts from the exciter curcuit. The speed of the motor from zero to maximum in either direction is controlled by means of a reversing rheostat, which controls the excitation of both generators, thus controlling the generator voltage and therefore the speed of the motor. Consequently the ship is operated at any desired speed and the main circuit is not interrupted when reversing. Mounted at the rear of the main switch-board panel is the reversing rheostat operated by hand-wheel. Automatic circuit breakers for overload protection, meters, knife-switches for generator and motor field circuit and a 2-pole, double-throw knife switch for each main generator armature-circuit, by means of which switches each generator may be connected in series with the other generator or disconnected leaving the other generator connected to the motor are provided. This arrangement makes it possible to operate at reduced speed when one generator is shut down or when it is desired to operate the ship at low speed for considerable time.

On the trial trip recently run the wonderful ease of speed control and quickness of reversing were fully demonstrated, a speed of 11.35 knots being attained with both engines, 8 knots with one engine, and while running full-speed ahead we are advised that full-speed astern was attained in 25 seconds and the ship put back into full-speed ahead in 15 seconds.



Electric equipment and switchboard in the engine-room of the "GUINEVERE"

Propeller Efficiency of Twin-Screw Motorships Versus Single-Screw Steamers

Interesting Paper Recently Read At Goteborg, Sweden, by Director Blache of Burmeister & Wain of Copenhagen

I DO not intend to give a comparative calculation showing the economic advantages of Diesel motorships over oil-fired or coal-burning steamers as has been done on numerous occasions. This should be of interest, but can be better accomplished by shipowners and their experts who possess the detailed knowledge of conditions on the various routes on which they have their vessels running.

One of the largest motorships we have built, the motorship "Afrika," belonging to the East Asiatic Co., 13,300 tons d.w. 4500 i.h.p. and a speed of 12 knots, has completed her first voyage to Australia and return on a mean-consumption of 14.1 tons of fuel-oil per 24 hours and a lubrication-oil consumption of 0.53 grams per i.h.p. per hour. The latter figure includes all lubrication, both cylinder and hand lubrication and waste in the forced lubrication system. Furthermore, the ship had an engine-crew of but 14 men in all. In good weather a speed of 12.5 knots was attained on a draught of 22 ft. 11 in. for'd and 25 ft. 6 in. astern, and mean 24 ft. 2½ in., corresponding to 14,000 tons displacement. The full-load displacement is 19,000 tons with a mean draft of 32 ft. The mean speed on a voyage from Port Said to Singapore under favorable weather conditions worked out at 12.05 knots.

The question of fuel-oil has been to the fore during recent years, as following the war the consumption was so large that the demand was rather out of proportion to the supply and to the available tonnage of tankers. These conditions have changed and the fuel-oil prices have a continuous falling tendency with crude-oil, suitable for Diesel motorships, and Diesel-oil is easily obtainable in all parts.

The oil companies, especially last year, have been emphasizing to us and to the owners of motorships the necessity of having engines burn the very heavy and impure grades of Mexican fuel-oils. The latter has a gravity of 0.95 to 0.96 specific gravity at 15 Cent. and flows at normal temperatures so slowly that it cannot easily be pumped, besides containing 3 to 4 percent sulphur and other undesirable impurities. I have, however, carried out various tests with this heavy fuel which shows that it is possible to design our four-cycle Diesel-engines so that they will be able to burn the same. Various alterations in the engine itself are required, including the intensive heating of all pumps, pipes and filters. Further, the fuel must be filtered, extra carefully, and the daily supply tanks, as well as the bottom tanks must be heated in order to pump-out the oil.

It is, however, my opinion that the use of this heavy fuel-oil offer no advantages for motorships, when it has to be stored in the double bottom-tanks of the vessel. When this heavy fuel is put into these tanks of the ship only a certain part of it can be pumped out again, as much of it will stick to the cold sides of the large flat tanks. Accordingly the effective bunker capacity of the vessel is reduced by 25 to 30 percent, also being in direct contact with the large ship's flat bottom, the fuel can only be heated intensely at a very great cost in steam consumption.

If ships are to be adapted to use this grade of fuel they should be provided with deep-tanks where the fuel can be heated, so that the whole contents of the tank can be kept liquid without too heavy a loss of heat supplied; also that the full amount of fuel that has been pumped into the tanks can be pumped out again.

Regarding the burning process of the fuel itself, this is satisfactory and gives actually slightly better resuts than the usual fuel-oil, based on useful heating value. I have taken-up with the East Asiatic Company as to whether they are interested in such vessels, or in having their existing motorships altered to use this heavy fuel, but they state they see no reason to depart from the lighter fuel, as the difference in price is not enough to make them consider the alterations required. It is my impression that the question is really of little interest, and has mainly been raised by the oil-companies to increase the sales possibilities of the heavy fuel.

According to the latest information to hand, the price of oil in England is 105 shl. per ton for Diesel-oil and 90 shl. per ton for the heavy fuel-oil. For the U. S. Shipping Board's motorship "William Penn," Diesel-oil of 0.88 gravity was bought at 4.8 cents per gallon ($2.02 per barrel) last May in Philadelphia. The price of heavy Mexican oil was at the same time $1.95 per barrel. As the Diesel-oil has about 5 percent greater heating-value than the thick oil it will be seen that the saving is immaterial.

I will next deal with the relative merits of the single and twin-screw motorship, as it has been observed that this is generally not clear to many. Even some of our licencees do not fully understand why we build our motorships chiefly as twin-screw vessels.

The opinion generally expressed is that Burmeister & Wain's motorships have been constructed as twin-screw vessels with a view to safety and the reason they have recently started to build single-screw ships is that the reliability of the single-screw engines has so increased that they can venture upon the building of the single-screw vessel.

The question of reliability in service was an influence when building the first motorship as a twin-screw vessel, as we considered that these first engines might disclose some faults in design, also that it may be necessary to inspect some of the engine parts, requiring short stops of one engine at a time. We did not have in mind reliability in the general meaning as usually expressed, that is that breakdowns would often occur, requiring stoppage of engines for longer periods. This later consideration had no deciding influence in our subsequent motorship designs. If it is a fact that with the marine Diesel-engine there was to be expected frequent breakdowns of one engine, or in other words, if a vessel, say of 11 knots speed, must make part of the voyage at about 9 knots, then the Diesel-engine would have been unsuitable for economical reasons, and never would have been developed to such an extent. After building Diesel-engines for nine years there are 66 motorships representing a total horsepower of 197,490 in engines of our make sailing the seas.

It has been proved that the Diesel-motorships carry-out uninterrupted non-stop runs of 50 to 60 days duration, and there is a report of one ship that actually made an uninterrupted voyage of 83 days, broken only by a few short calls in harbors. During this time the engines were not touched, which practice, however, we do not recommend.

In originally choosing twin-screws, the consideration as to the size of the cylinders was of importance, as we did not consider it advisable to embark upon the larger cylinder dimensions until certain experience was gained. At the same time shipowners desired to get larger and speedier ships, so we realized the advantage of remaining steadfast to the twin-screw system in high powers.

Now that our workshops have been extended and improved, we can adopt larger dimensions than previously. We now are able to build single-screw engines up to 4,000 i.h.p. and expect shortly to produce even greater horsepowers, if the demand is for such sizes. Thus, we are left quite free to choose between single and twin-screw ships.

The chief reason which made us decide in favor of the twin-screw system is as follows: In ships the relation between length, beam and depth characterize the craft, so the deciding factor in the ratio between engine-cylinder bore and stroke. Originally we took this ratio at about 1.33 on the basis of experience in the manufacture of stationary Diesel engines. Thus the "Selandia" had a cylinder bore of 540 mm. and a stroke of 740 mm., and the "Suecia" 500 mm. cylinder bore and 660 mm. stroke, or a ratio of about one and one-third. With this bore-stroke ratio, and with due regard to the velocities that are permissible through the inlet and exhaust valves normally fitted in such an engine, the most suitable number of revolutions was 100 to 150 p.m. We then strived to attain the same efficiency with the twin propellers at the above number of R.P.M. as is generally obtained in cargo-ships with single-screws at the lower revolutions at which steam engines operate.

We based our screw calculations upon well-known data, such as Taylor curves, taking into consideration the influence of the speed of the wake, which is a very important factor in calculating screws, in accordance with the formula of Professor McDermott. We find that our screws come-out very close to the correct results, and naturally continuously verify our later calculations with the results we have achieved with the previously-built ships.

Results attained with these first twin-screw ships proved to be fully equal to what can be attained with single-screw vessels. This was clearly shown by the trials of the motorship "Suecia" and later with the motorship "Kronprinsessan Margareta" built for the North Star Line. The latter company showed such an interest in the matter, that they had trials run with full-load and clean bottom, and also made similar tests with the steamer "Prinsessan Ingeborg" previously built at our yard. Such tests are of the utmost interest to naval-architecture, as it is very seldom that shipowners go to the expense and trouble involved in carrying out tests of this nature.

With the "Suecia," trial runs were carried-out up to 11½ knots and the curves of the results with S.S. "Prinsessan Ingeborg" are shown on fig. 2, the maximum speed of the latter vessel also being 11½ knots. In fig. 3 the results taken from these curves represent a comparison of these two ships at 11 and 10.2 knots respectively, the latter speed being the usual one of a steamer like "Prinsessan Ingeborg." It will be noted that the motorship "Suecia" ran at 149 R.P.M. corresponding to a speed of 11 knots. If the speed is corrected for the speed of the wake the speed through the water is 9.45 knots, and, with the above number of R.P.M. gives a maximum efficiency of the propeller of 62.9%. The corresponding revolutions of S.S. "Prinsessan Ingeborg" is 67.5% and correcting for the speed of the wake gives a corresponding relative speed of screw through the water of 8.03 knots. This gives an estimated propeller-efficiency of 63%, the same as for the twin-screw ship. **(The figures and drawings referred to will be given next month, they not yet having arrived by mail.—Editor).**

For 10.2 knots the number of R.P.M. for motorship "Suecia" is 136.4. The correction for the speed of the wake giving a relative speed of 8.76 knots and a corrsponding maximum propeller-efficiency of 62.9%. The relation works-out again exactly the same for S.S. "Prinsessan Ingeborg," the latter also having a propeller-efficiency of 62%.

The results of the trials show that the motorship "Suecia" took 2,140 i.h.p., or 1,710 shaft h.p. to make 11 knots. The tow-rope resistance, without taking into consideration the thrust or deduction, gives 1,150 h.p. and the propulsive-efficiency or combined efficiency of hull and screw, or the ratio of tow-rope h.p. to shaft h.p., is 67.2%.

For the S.S. "Prinsessan Ingeborg" the corresponding i.h.p. is 2,050 or say 1,750 shaft h.p. The tow-rope horsepower is 1,080 and the total efficiency of the ship and screw is 61.8%, or less for single-screw ship than for twin-screw vessel. But, as this speed (the economical one for this vessel) has also been exceeded here, I have worked out the comparison for 10.2 knots also.

which gives for motorship "Suecia" 1,710 i.h.p. at 1,350 shaft h.p. and 900 effective tow-rope h.p., the total efficiency of ship to screw being accordingly 66.7%. The corresponding figures for S.S. "Prinsessan Ingeborg" are 1,650 i.h.p. or 1,400 shaft h.p. and 855 effective tow-rope h.p. and an efficiency of 61%. The result showed that we had obtained with the twin-screw ship an equally good, or better, total efficiency than with the single-screw ship.

The trial with motorship "Suecia" was carried out in the Christiana Fjord in smooth sea. We later made an analogous trial with motorship "Pedro Christophersen" at Göteborg, but outside the belt of rocks and islands girding the coast. There was little swell that day, but some current ran across the course so that the latter had to be changed during the run. This resulted in somewhat inferior results to the previous trials with motorship "Suecia," so we thought that errors had possibly slipped-in at the readings for motorship "Suecia." With the motorship "Kronprinsessan Margaretha" a test was again carried-out with full-load in the same way as with motorship "Suecia" on the Christiana Fjord and the results coincidenced exactly with those for motorship "Suecia" and proved thus clearly that the test with the latter was correct, and that the poor results were entirely owing to the more open sea on which the runs of "Pedro Christophersen" had taken place. The runs of S.S. "Prinsessan Ingeborg" have been carried-out in the Oresund off the Isalnd, where the conditions are no doubt equally good as on the Christiana Fjord. Perhaps there is sometimes some current, but the latter runs at any rate direct in or against the course.

Both S.S. "Prinsessan Ingeborg" and motorship "Suecia" are equipped with bronze propellers, so it is safe to presume that the comparison of the two ships is complete and fair.

On the basis of these results we continue to build our motorships as twin-screw vessels, although in case of the larger ships we reduce the number of R.P.M. somewhat in order to attain the same efficiency. So the larger engines have been built with a corresponding slightly larger relation between cylinder bore and stroke. Thus we have passed from the ratio of 1.3 to one nearer 1.5.

We built the "Tongking" class in this manner. These are Diesel-driven vessels of 425 ft. length with 3,100 i.h.p. in twin-screw engines of 125 R.P.M. and a speed of 11.5 knots fully loaded. Their displacement is 13,500 tons. With correction for the speed of the wake, the relative speed in relation to the screw is 9.6 knots for these vessels, the propeller efficiency working-out at 63%.

Also we built for the East Asiatic Co. the large motorships "Afrika" and "Malaya." These vessels are of 19,000 tons displacement and designed for a speed of 11.8 knots fully loaded. The engines together develop 4,500 i.h.p. at 115 R.P.M. The relative speed between screws and water is 10.15, which gives a maximum theoretical propeller-efficiency of 63.6%.

The motorship "Fionia" is a specially fine-built ship of 12.5 knots fully loaded and 13 knots with a lighter cargo. Besides being a cargo-vessel she is equipped to carry 40 first-class passengers, as the cabins are especially well fitted. For this vessel we tried to make the propulsion condition still better than our previous achievements. The engines together developed 4,000 i.h.p. at 100 R.P.M., and at a speed of 12.5 knots a theoretical propeller-efficiency of 67.3% could be attained.

The Götaverken built the same size engine as we installed in the motorship "Fionia," i.e. of 4,000 i.h.p. at 100 R.P.M. for the motorships "Bullaren," "Tisnaren" and "Elmaren," which were designed for a speed of 12 knots, when a maximum theoretical propeller-efficiency of about 66% can be attained.

Whether these ships could attain the same propulsion relation as with a single-screw depends upon the number of revolutions chosen in the latter case. It is my opinion that for the "Tongking" class the number of R.P.M. must then be lowered to about 70 to 75 R.P.M. and for vessels of the size of "Afrika" to 65 to 70 R.P.M.

The wake gain is here the deciding question, the relation of which is of a very complicated nature. The highest speed of the wake for single-screws placed in the central plane of the ship than for the twin-screws located more in free water, results in a lower ratio of the relative speed of the water in relation to the screw for the single-screw ship than for the twin-screw one. For the number of R.P.M. in question for these cargo-vessels the characteristic relation for the screws is such that the efficiency will increase when the relative speed between screw and wake is increased.

In other words, it is detrimental to the propeller efficiency of the single-screw vessel having the propeller where the wake has the greatest speed. The gain due in thrust deduction is not available as it is spent in overcoming friction and producing a whirling motion in the water. It is thus evident that one should strive to produce a shape of ship giving the smallest possible wake. This is what we have attained with our stern of vessel, and in my opinion, have been confirmed from the above mentioned trials with "Suecia." There has been no opportunity yet to have made by any full-power runs fully-loaded carried-out with the larger ships over the measured mile. We have certain confirming data from reports of the voyages of the ships results, where fully-loaded with a fairly clean bottom and good weather conditions and where the logged and observed distances almost agree. Thus the motorship "Theodore Roosevelt" has with a displacement of 14,960 tons and a draft of 28 ft. 11 in. made 11.58 knots at 133 R.P.M. and 3,331 i.h.p. which corresponds to 1,610 tow-rope h.p. The corresponding maximum theoretical efficiency that can be expected is 63.4%.

The motorship "George Washington" has, with 13,550 tons displacement and 26 ft. 5 in. draft two different readings, one of 11.83 knots at 129 R.P.M., with 3,298 i.h.p., and one of 11.5 knots with 3,213 i.h.p. and 129 R.P.M., which corresponds to a total propulsive-efficiency of 67.4% and 63.1% respectively with a corresponding maximum propeller-efficiency of 64.1% and 63.6%.

These readings as above mentioned have been obtained in the open sea during the voyages of the ships, and thus give less reliable results as when the readings are obtained over the measured mile. The results would no doubt be improved if the trials were carried out in the Oresund, the Christiania Fjord or similar calm waters, as demonstrated by the experience obtained from the results of "Pedro Christophersen" outside Goteborg, compared with those of motorship "Suecia."

The same applies to motorship "Fionia," and I have readings which extended over 4 days, the total efficiency of the propellers being 60.4%, while their theoretical-efficiency is 67.7%. The condition is thus not so favorable as in the above mentioned cases. Yet I must draw attention to the fact that the results obtained are better than those estimated for the ship, or in other words the ship has completely maintained the guaranteed speed and horsepower.

As mentioned above, I believe that these results have come from giving the stern the proper shape, whereby the following wake becomes as small as possible permitting the water to enter the propeller under most favorable conditions. The gain in total propulsion caused from the working of the screw in the water following the ship, is counteracted by the influence of the hull in front of the screw, causing the water to rise in whirl formation along the side of the ship. In the twin-screw ship it is of importance to arrange the shaft bossing correctly. If they are placed wrongly it results in a very considerable increase in resistance. For the shape of ship used by us the bosses are placed as far as possible horizontal, so that the current of water passing up along the stern is by means of the bosses led perpendicular to the plane of the propellers. Similar conditions are not to be met with with the single-screw.

So I have come to the conclusion that it is still correct to build the larger motorships as twin-screw vessels, and the bigger the ships are and the higher the horsepower to be transmitted through the screws, the greater is the advantage of using twin-screws.

The relation between single and twin-screws is, however, of a very complicated nature. During late years, research work has been carried-out by Mr. Luke in England, published in the Institution of Naval Architects 1910 and 1917, and by Herr Schraffran of Germany, published in Schiffbau 1919. However, reliable figures and actual test results with similar ships are of the greatest importance for the solving of this question.

I have in the table given the figures of the motorship "Yngaren" belonging to the Trans-Atlantic Steamship Company, and equipped with a single-screw Doxford oil-engine of 3,000 b.h.p. at 77 R.P.M. The speed of the ship is 12 knots which gives a maximum theoretical propeller efficiency of 62%. If this is compared with the motorship "Bullaren," "Tisnaren" and "Elmaren" of the same company, which have twin-screw engines of our type, built by the Götaverken it will be seen that the theoretical propeller-efficiency of the twin-screw ship is greater. Here the question of the wake gain comes in again, and it would be of great interest if the Transatlantic Company would show its interest in the matter in having these vessels carry-out speed trials with fully loaded condition and clean bottoms over the measured mile. But the trials should be run over the same course and under same equal and calm weather conditions as otherwise the results obtained might differ more than those obtained between the propulsive efficiencies of the single-screw and twin-screw ship run under same conditions.

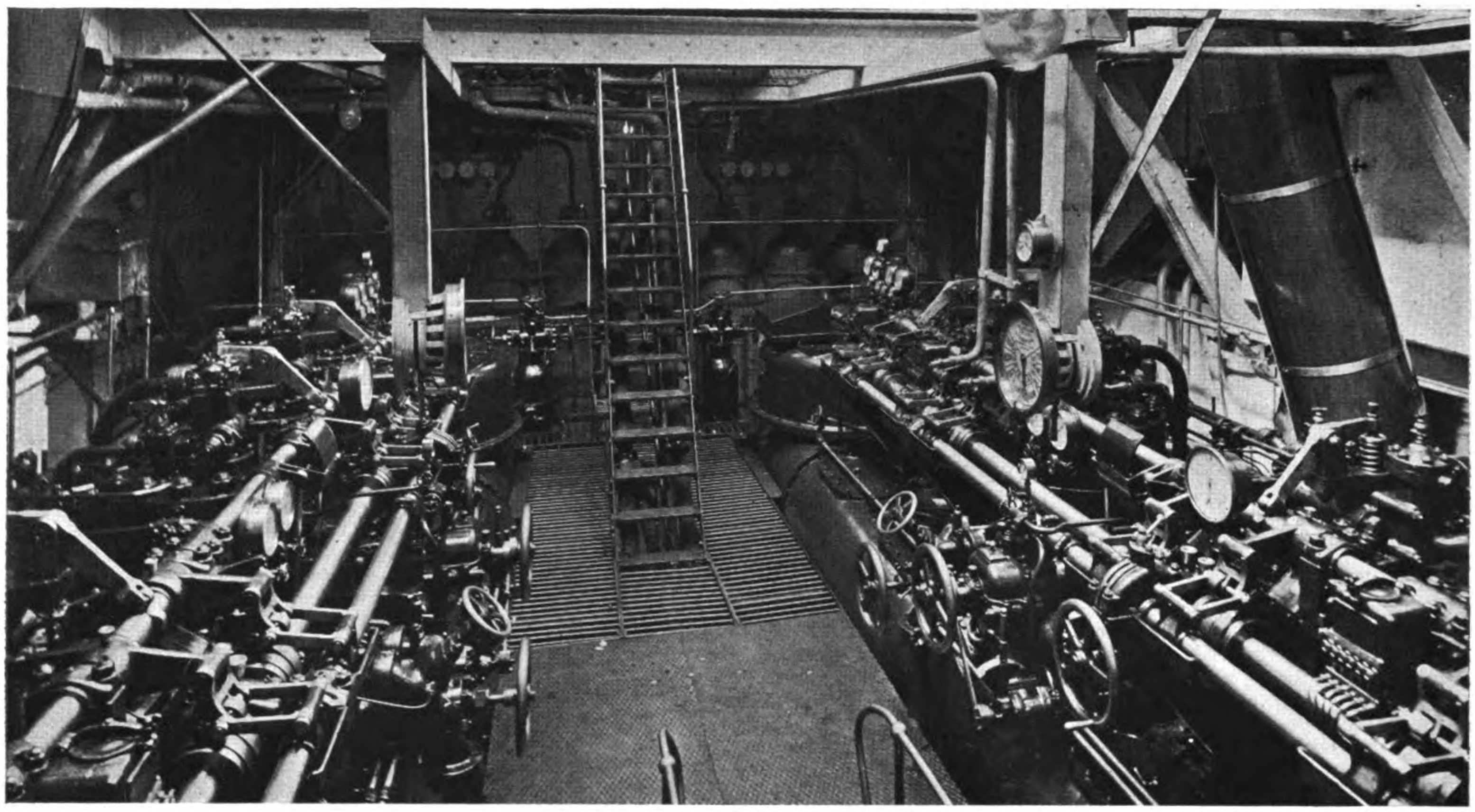
The equal advantages in using single and twin-screws lies in my opinion at about the 2,100 h.p. with 150 R.P.M. for the twin-screw installation and 90 R.P.M. for the single-screw installation.

Fig. 4 shows such a twin-screw installation with the necessary auxiliaries in our most modern type of vessel. I would like to call attention to our new two-collar type of forced-lubricated thrust-bearings which occupy, as you see, less space than the Michell thrust-bearings that have been so much referred to and employed during later years. **(Kingsbury in the U. S. A.—Editor).**

Fig. 5 shows the corresponding single-screw engine of 2,100 h.p. and 90 R.P.M. The weights of such two installations are nearly the same as the two shafts with tunnels, bosses and propellers for the twin-screw installation weighing almost the same as the one heavier shaft and the single large screw for the single-screw installation. The main machinery in the single-screw ship is about 8 to 10 tons lighter than in the twin-screw ship; but, at the same time it should be remembered that the displacement of the bosses gives a corresponding larger carrying-capacity. The engine-room in the single-screw ship can be made narrower, but requires a long engine casing and recess in the forward bulkhead. As to the deck arrangement this can generally be taken care of very easily. The two engine-rooms are shown compared in fig. 6, from which it will be seen that they take up practically the same cubic-space. However, in cargo ships of the size in question, and built as awning or single-deckers, the engine-room comes out smaller than the prescribed deduction in tonnage so that for this reason the engine-room generally has to be made larger than necessary.

The conditions are different in the small ships where the two tunnels in the twin-screw ship will take up such a large proportion of the useful space in the after hold, and where the smaller horse power to be transmitted to the propellers can easier be arranged with equal good propeller efficiency with the single-screw.

For such single-screw ships we have brought out a completely new type of engine where the characteristic main dimensions of the engines the ratio of stroke to bore has been increased to 2. At a low number of R.P.M. a favorable piston-speed is thus obtained for getting the full effect of the engine. The dsigning, nevertheless, must be carried out very carefully, otherwise the engine is apt to become too heavy. We have constructed this engine on the basis of experience we gained previously when building Diesel-engines for submarines, in which we succeeded in lowering the weight very much through having the parts that have to sustain the high combustion and compression pressures, and which accordingly have to be solidly constructed to form the strong and rigid elements in the engine. This system has been carried out with long stay bolts extending from the top of the engine to the lower side of bed plate for absorbing the large combination pressures.



View in engine-room of the "CONDE DE CHURRUCA," showing twin Armstrong-Sulzer engines

Spanish Motorship "Conde de Churruca"

Sulzer Diesel-engined Tanker Built in England—A Vessel With Many Interesting Features

READERS of "Motorship" will have noticed that during the last few months an unusually large number of new Diesel-engined merchant-vessels have been launched and run trials, making it practically impossible for "Motorship" to properly describe and illustrate them all in the month following. This includes the Spanish motor-tanker "Conde de Churruca" recently completed by Sir Wm. Armstrong, Whitworth & Co., of England and propelled by twin 1,250 shaft h.p. Sulzer two-cycle type Diesel-engines. This vessel, however, was illustrated in our October issue and we are now enabled to devote sufficient space to an adequate description. At the trials of this vessel, one of our British editorial correspondents, named Mr. J. L. Chaloner was present and the following article is one of the most comprehensive descriptions of this vessel's machinery yet published.

Whatever degree of intensity and vigor the debate on the relative merits of the 4-stroke and 2-stroke oil-engine has reached to-day, it must be remembered that the controversy—and of such there exists no small measure,—has up-to-now centered largely around performances and running data of stationary plants. It is, therefore, for this reason alone, if for no other, that the completion of the "Conde de Churruca" has been awaited with great interest. Her initial career will be watched very closely by all parties, following the development of the Diesel engine, mainly for the specific reason of obtaining some sound practical information on the behavior of large type marine 2-stroke engines. The vessel will materially assist in straightening-out the many arguments which have been put forward to prove both the merits and demerits of this type of engine.

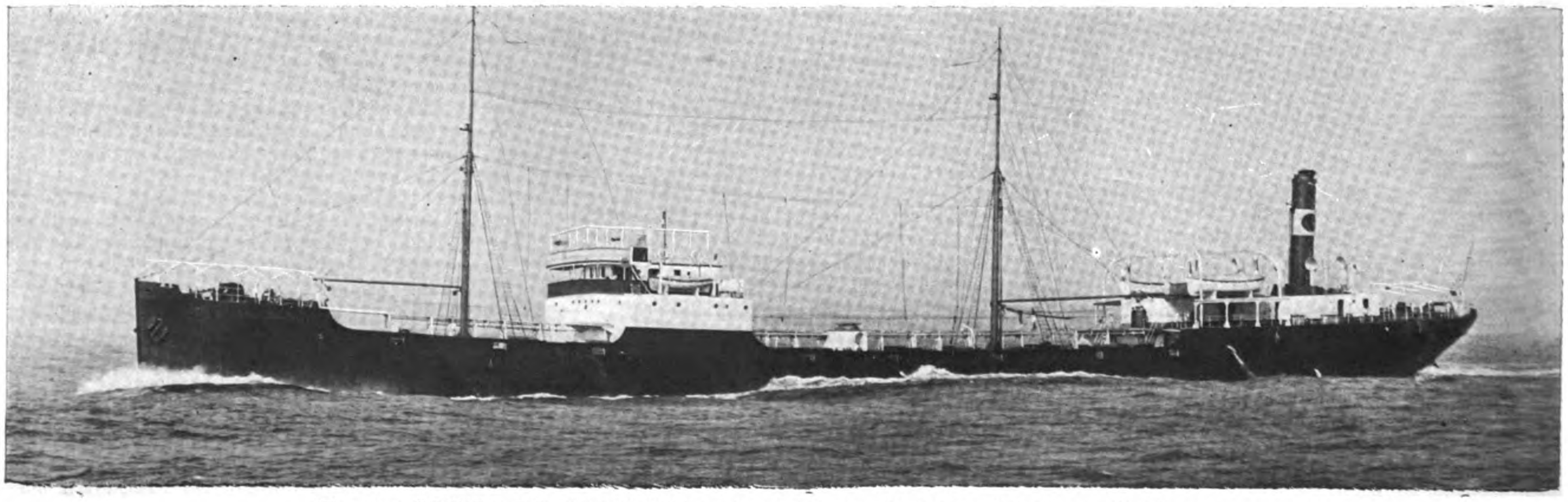
The vessel has been built by Sir W. G. Armstrong, Whitworth & Co., Ltd. at their Walker Yard, Newcastle-on-Tyne, England, for the Sociedad Commerciale de Oriente de San Sebastian, which firm took delivery last month after a very satisfactory official trial off the Tyne. We believe that this company may be associated with the Cia General Cie Tabacos de Filipines, whose name has frequently been given as owner. The ship is built to meet Lloyd's requirements for 100A1 class, and is a steel, twin-screw, 2-masted motor-tanker with 2 decks (steel) and machinery aft. She is fitted out to carry oil in bulk, and is equipped on modern lines including electric light and wireless.

She has the following dimensions—

Deadweight capacity	6,500 tons
Gross tonnage	4,500 tons
Power	2,500 shaft h. p.
Engine-speed	100 R. P. M.
Ship's speed	11½ knots at 24 ft. 11 in. dft.
Length O. A.	383 ft.
Length B. P.	370 ft.
Breadth	48 ft. 7 in.
Depth (Md.)	30 ft.
Mean loaded draught	24 ft. 3 in.
System of construction	Isherwood
Classification	Lloyds 100 A1

The nature of the cargo necessitates the main cargo-tanks to be steam-coiled, which first of all accounts for the comparatively large donkey-boiler installed, and furthermore for the deck-machinery being steam-driven. One steam-windlass and two steam-winches comprise the main gear on deck. The steering-gear is of the electric-hydraulic type, hence when under ballast, no steam need be carried on the boiler. The donkey-boiler is 10 ft. 6 in. dia. by 11 ft. 6 in. long, with a working pressure of 120 lbs. per sq. in. The two furnaces are fitted with the Wallsend Howden single-unit pressure-jet system designed for natural draft. The equipment includes a surface-condenser of 600 sq. ft., a small feed-pump, feed-filter and float-tank. The machinery is placed aft and the general arrangement is shown on the accompanying drawing.

There are in the engine-room two 4-cylinder



The m.s. "CONDE DE CHURRUCA" on her trial run—Reproduced from our October issue

2-stroke Armstrong-Sulzer marine oil-engines, each developing 1,250 shaft h.p. at 100 r.p. min. with cylinder dimensions of 23¾ in. dia. x 37½ in. stroke. At the forward end of each unit the extension of the main crankshaft carries a double-acting scavenging-pump and a single crank 3-stage air-compressor working up to 1,200 lbs. per sq. in. Special automatic suction and delivery valves of very small lift are fitted to the scavenge-pump. Valves of similarly low lift design are fitted to the compressor and are arranged for the whole of the suction or delivery valves of any stage to be withdrawn and replaced or examined without breaking any important joints.

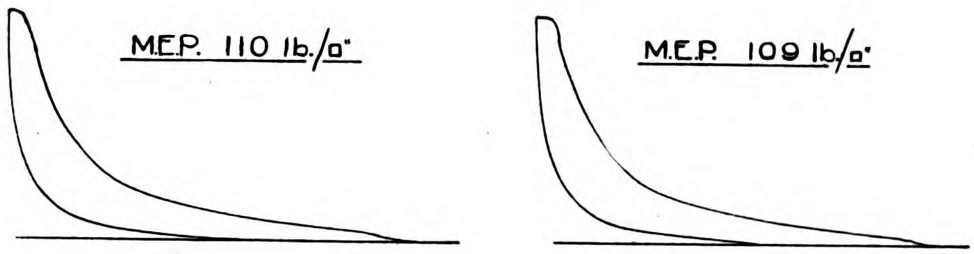
On the extreme forward end of the crankshaft a crank is fitted for driving the circulating-water (jackets, etc.), pumps and the lubricating-oil pump, each of sufficient capacity to supply both main engines in case of emergency. Three single-acting plunger-pumps are driven by levers off the scavenging-pump crosshead, and do duty as piston-cooling water (sea-water) bilge and sanitary pumps respectively. The fuel-pump is of the multi-plunger type; the oil supply to each cylinder is under separate control and the quantity proportionate to the load on the engine is hand-controlled by timing the lift period of the fuel-pump suction-valve.

Any cylinder may, therefore, be cut out as required. A series of illustrations of the Sulzer engine were given in our issue of November, 1919. The general design of the Armstrong-Sulzer engine follows the modern Sulzer practice, which of course includes the controlled port-scavenging valve. The scavenging-air under very low pressure passes through a series of ports arranged around half the circumference of the cylinder at the bottom of the piston stroke, the exhaust-gases being expelled through a similar set of ports arranged in the opposite side of the cylinder. The scavenging-ports are arranged in two rows, one above the other. The opening and closing period of the bottom row is controlled by the piston, which also controls the opening and closing of the exhaust ports.

The admission of scavenging air to the top row of ports is under the control of a rotary-valve, whereby scavenging-air is only admitted when the exhaust-gases have reached their lowest pressure; furthermore, the auxiliary scavenging-air is not cut-off until the exhaust ports are closed, hence there is a slight super-charge pumped into the cylinder for the subsequent power stroke. This arrangement permits of a symmetrical cylinder head, the only hole in the centre being provided for receiving a casing containing both the fuel-valve and air-starting valve, together with a safety-valve.

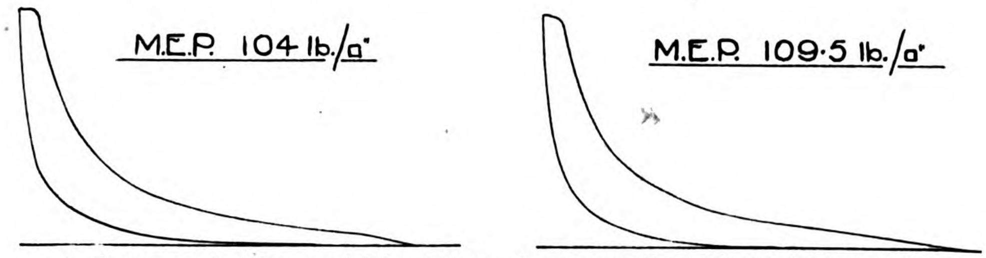
The pistons are water-cooled and owing to the whole system working under atmospheric pressure, sea-water has been found quite suitable. The water enters the upper part of the piston in form of a spray, impinging on the underside of the piston-top, and is carried away by telescopic piping to open funnel discharges fixed to the main engine framing. The discharge is, therefore, under constant observation by the engineer on watch.

To grasp the fascinating simplicity of the reversing gear, one must have seen it at work. A double set of cam-rollers are provided which engage corresponding cams for fuel and starting-air

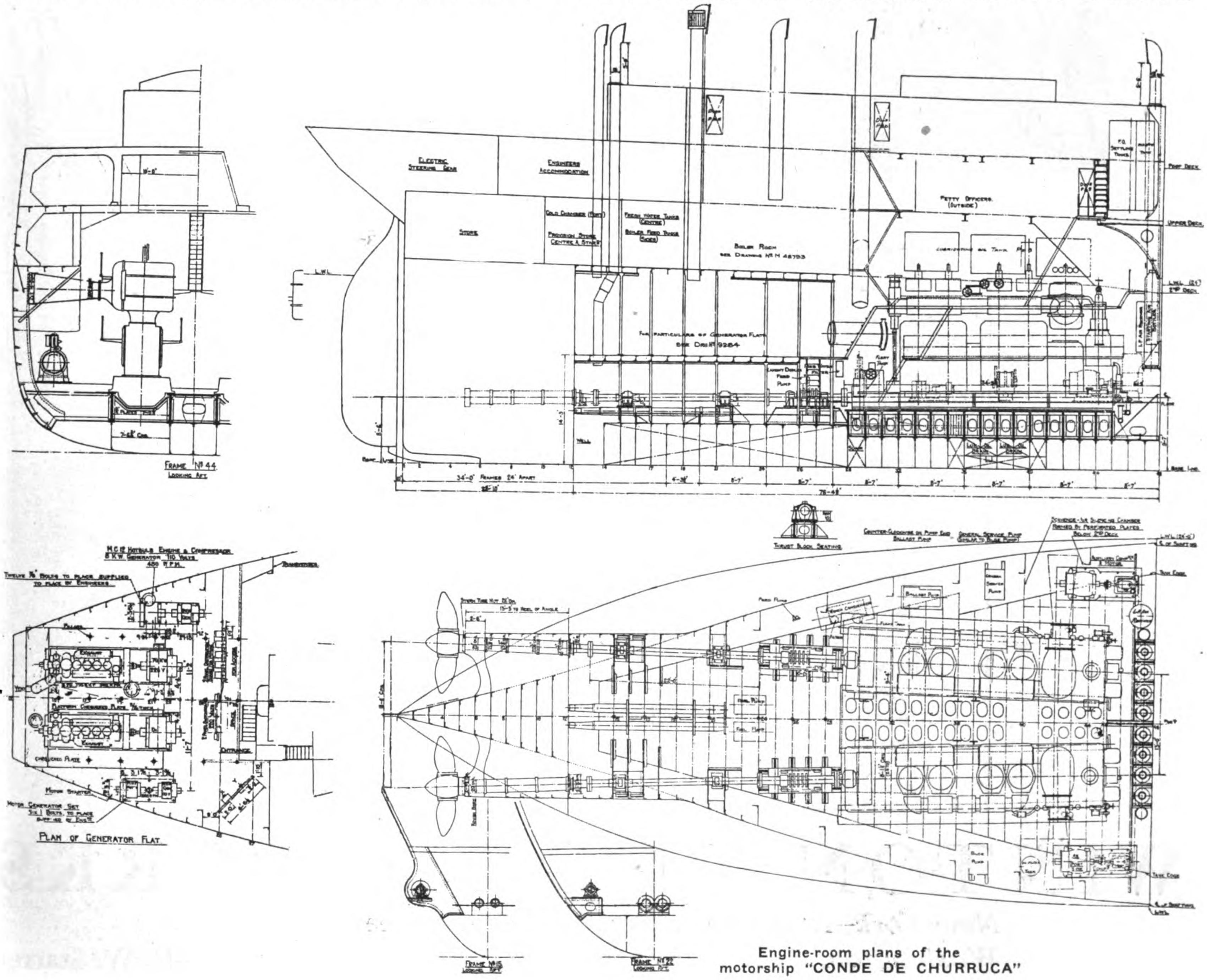


Time of taking cards, 8:00 A. M.

Speed	98 r.p.m.
I. H. P.	1,739
B. H. P.	1,251
Mechanical Efficiency	72.25%



Indicator cards taken on trials of the motor-tanker "CONDE DE CHURRUCA"



Engine-room plans of the motorship "CONDE DE CHURRUCA"

on a camshaft, driven in the usual way from the crankshaft by vertical shafting. A simple hand operating-gear engages the correct roller with its corresponding cam according to ahead or astern order from the bridge. The manoeuvering-shaft, illustrated, carries the fuel and air valve levers, mounted eccentrically, the whole of the operations being carried out by a small servo-motor driven by low-pressure air. A hand-operated emergency sets is provided as a standby. The change-over from the four cylinders on air to the same four cylinders on oil, after passing through the intermediary stage of two-cylinders on air and two on oil, is done automatically by simply opening the control-valve of the servo-motor, which thus controls the whole range of manoeuvering operations of one engine by the simple turning of a small hand-wheel.

There are two starting-valves arranged in each valve-cage in the cylinder head. One is controlled by a master-valve and is open during the whole time the cylinder is on air, the other is the mechanically controlled one for manoeuvering purposes. The starting-valve proper can, therefore, be dismantled and cleaned while the engine is running, certainly a most practical feature, when one remembers the great tendency which these valves have for sticking or gumming up.

Manoeuvering was carried out with a precision, which came as a revelation to the many steam-engineers, who were present during the trials. From full-ahead to full-astern not more than 12 seconds were required, and as low a pressure as 200 lbs. was still sufficient to continue the manoeuvering operations. The controls are on the top platform. There is no difficulty of arranging the controls on the bottom platform, and this would seem preferable. It is more conventional and would make the average motor-engineer, who today is mainly drafted from the ranks of steam-engineers, feel more at home with his job. This may only appear a sentimental reason, but even if so, it is in this case a very important one.

Very light, but large aluminum doors are fitted to the main-engine framing, facilitating the inspection of the working-parts while the engine is running. The top halves of the doors may be removed from the middle grating, and the bottom halves from the bottom platform. The engine is, therefore, completely enclosed, this being necessary, as all main bearings, connecting-rod top and bottom ends, crosshead guides and other important bearings are supplied with oil under pressure.

At the aft end of the engine-room is the dynamo flat, where two 4-cylinder Sulzer 2-stroke Diesel, 70 k.w. electric generating-sets are fitted. Each engine is rated at 100 b.h.p. when running at 300 r.p.m. The general design is on similar lines to that of the main engines. One set is sufficient to deal with the whole of the load at sea, the working voltage being 220 volts, controlled by switchboard on the fore end of the dynamo flat and shown in Fig. 8.

Two motor-driven auxiliary air-compressors a e used for charging up the air-reservoirs, of which eight are fitted on the forward bulkhead of the engine-room. In addition the auxiliary air-compressors are available for augmenting the main engine compressors during uncommonly long maneuvering periods, and for acting as standby sets, in case the main-engine compressors give out.

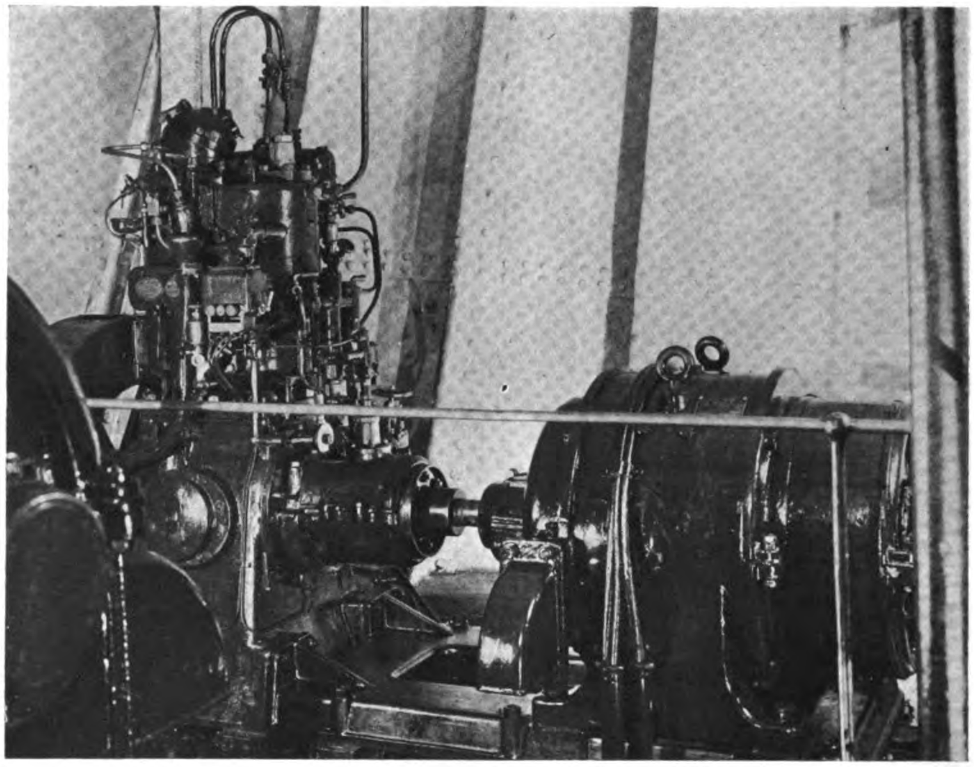
They are designed for pressures up to 1,200 lbs., and there is a complete system of cross connections between the compressors of the main engine, either of the two auxiliary-sets, and the air-reservoirs. There is a further cross-connection to a standby compressor-set consisting of a 12 b.h.p. 2-stroke Sulzer hot-bulb engine combined with a two-stage compressor capable of delivering air of 1,200 lbs. p. sq. in. This unit can be started by hand, hence if all the air in the reservoirs is lost, this set can be started, till sufficient air is available for getting one of the auxiliary lighting-sets started for pumping up the bottles.

There is also a low-pressure air-receiver, which can be charged through a reducing-valve from the h.p. bottles. This air is used for the servo-motor (manoeuvering-gear), the turning-engine, the small duplex Worthington (air-driven) for lubricating-oil work, and the whistle. In addition there are on board: **One** rotary ballast-pump (electrically driven), which can circulate the auxiliary condenser, and act as a standby to the circulating pumps for the cylinder jackets, driven off the main crank. **One** 2-throw double-acting vertical plunger-pump (electrically-driven), for general service, and also as standby for the piston-cooling system, or circulating system for the auxiliary generating-sets. **One** duplicate of the above, acting as a bilge-pump. **Two** oil-fuel transfer-pumps, electric-driven and of the roto-plunger type, one acting as a standby. They each are rated at 12 tons per hour.

For the ship's lighting, etc., a small rotary transformer (110 volts) is fitted, and as a standby an 8 k.w. generator is coupled to the hot-bulb engine (Fig. 11). There are, of course, the various cross connections to the different pumps for use in emergency cases.

Two grades of fuel are carried for the main engines, auxiliaries, etc., on one hand (Diesel-oil), and for the donkey-boiler on the other (fuel-oil). The oil is stored in the cross-bunker forward of the engine-room, and in the double-bottom tanks under the engine-room. The roto-plunge transfer pumps keep the daily service-tanks (settling-tanks) supplied, of which there are two of 12 hours capacity each situated at the forward end of the engine-room (on the upper deck level).

The lubricating oil is carried in 6 tanks (3 on either side) fixed in the engine-room. There are two drain-tanks situated in a recess in the double-bottom oil-fuel tanks, whence the oil is pumped back into the lubricating-tanks for re-use.



Emergency air-compressor and electric generating set

During the trial a large and distinguished party watched the behavior of the engine both as regards speed trials as well as manoeuvring qualities, with an engine-speed varying from about 100 down to 30 r.p.m.

The following records were taken during the official trial and a set of indicator cards are reproduced:

OFFICIAL SEA-TRIAL

	Port	Star	
Duration of trial			6.45 a. m. to 12.45 p. m.
Counter reading, beginning of trial	152,347	18,268	
Counter reading, end of trial	188,530	54,690	
Average revs. per min	100.5	101.2	
Average B. H. P.	1,215	1,245	
Total			2,460
Total fuel used			716 gallons
Actual time of consumption test			5 hours, 55 minutes
Grade of oil used			Mex Gas-Oil, Sp. Gr. 0.873 Flash point 169 ° F
Fuel used (by weight)			6,250 lb
Fuel used by main engines			6,136 lb
Fuel used by auxiliaries			114 l b
Fuel (main engines) per B. H. P. hour			0.421 lb

Air Compressor Readings

	Port	Star.
	Lbs. per sq. in.	
Injection-air pressure	955	965
Air compressor readings—		
L. P. Stage	18	21
I. P. Stage	137	142
H. P. Stage	955	965

The daily consumption for the engines and auxiliaries works out at 11½ tons of Diesel-oil, and the donkey-boiler can burn up to 5½ tons of fuel oil according to the requirements of the heating-coils.

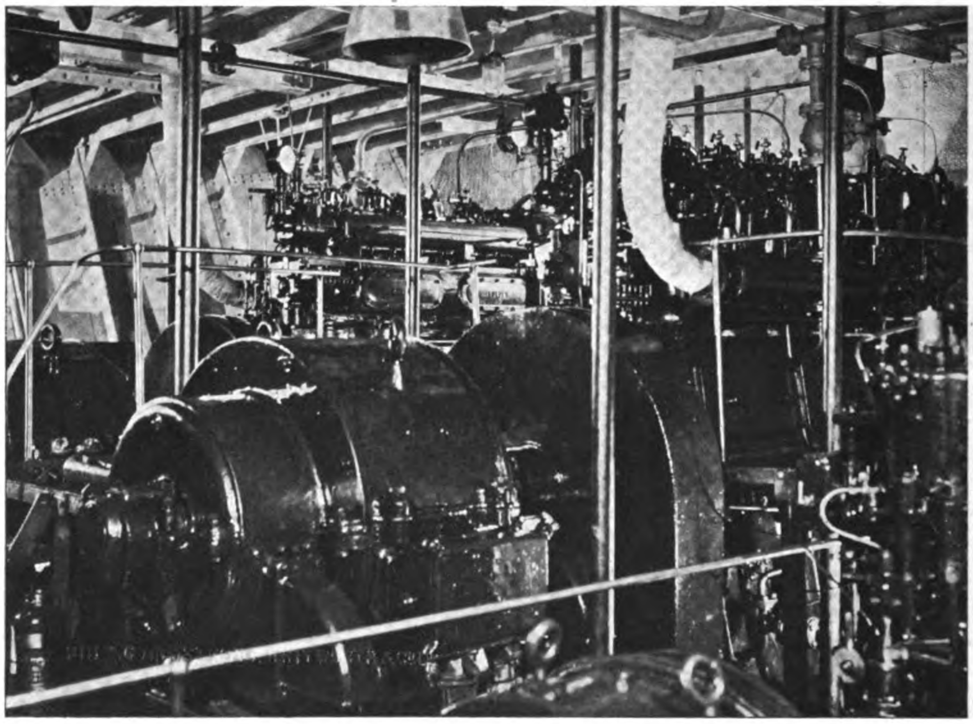
Among noteworthy men at the trials was Dr. Hans Sulzer, who is one of the directors of Sulzer Freres of Winterthur, Switzerland, and who until recently was Minister from Switzerland at Washington, D. C. In a speech he referred to the U. S. authorities having sent a formal invitation to the Swiss Naval authorities to be present at the opening of the Panama Canal. While they had no admiral in Switzerland, says Dr. Sulzer, he was sure no one could be prouder than the Swiss who stood on the bridge of a vessel propelled by Swiss Diesel marine-engines. He felt this engine would be a success and that there is a great future for it.

FURNESS-WITHY WILL OPERATE NEW MOTORSHIP

The sister single-screw motorship of the "Yngaren," building for the Transatlantic Steamship Company of Goteborg, Sweden, by Wm. Doxford & Sons of Sunderland, England, has been taken over by Furness-Withy & Co., who for some years have been general agents in the United States for this well-known Swedish firm.

NEPTUNE DIESEL-ENGINE TANKER BUILDING

Now under construction at Swan, Hunter & Wigham Richardson's shipyard at Wallsend-on-Tyne is a 6,500 tons motor-tanker in which two 2,000 b.h.p. Neptune-Polar Diesel-engines completing at their Newcastle works will be installed.



Electric light sets in dynamo flat

Interesting News and Notes From Everywhere

WILL BUILD TOSI DIESEL-ENGINES

Licenses to construct Tosi Diesel marine-engines have been acquired by Richardson Westgarth of Middlesbrough, and by W. H. Allen, Sons & Co., Bedford, Eng. The success of the motorship "Ardito" was partly responsible.

WESTERN UNION CABLE MOTORSHIP

We understand that the awarding of the contract for the construction of this vessel has been held-up pending checking-up bids from Great Britain and France. Incidentally, in view of the fact that Diesel-electric-drive only is being considered, we wonder why many magazines insist upon referring to her as a "steamer."

NAMES OF AMERICAN-HAWAIIAN STEAMSHIP CO.'S MOTORSHIPS

"Californian" and "Missourian" are the names of the two motorships for the American-Hawaiian Steamship Company now building at the Merchants Shipbuilding Corp. yard at Chester, Pa., which are being Diesel-engined by Wm. Cramp & Sons Ship & Engine Company. The namesakes of these vessels were steamers and were sunk during the war. They will be launched this month.

AN EXPENSIVE SHIP

In connection with the construction of the 850 tons d.w. Diesel-driven motorship "Granit" for the Harald Grenske Steamship Co., the "Scandinavian Shipping Gazette" says a huge bill was presented by the builders, namely, the Trosvik Slipway & Engineering Company of Brevik, Norway, which the owners naturally refused to pay. The vessel was ordered on the conditions that payments were to be on a sliding scale, and an invoice for 1,400,000 kroners was delivered, or 1,650 kroners per ton.

DISCUSSION ON METTEN AND SHAW'S PAPER

In our September issue, in connection with the above Discussion, it was stated that Mr. Verhey advocated double-acting, four-cycle engines. However, what Mr. Verhey did actually say was—"It is suggested that the two-cycle single-acting engine be given serious consideration. This engine can also be converted to a double-acting engine with equal chances for success, if properly designed. We cannot help but keep an eye on the development in Germany with the two opposed-piston type engines."

1,000 tons d.w. motorship "VIRGINIA" shortly after her launch at the Nakskov Shipyard. She is owned by the East Asiatic Co. and propelled by a 350 shaft h.p. Holeby Diesel-engine

NEW SWEDISH MOTORSHIP "ARATOR"

The 7,200 tons d.w.c. motorship building at the Kockums shipyard, Malmo, to the order of the Swedish Farmers Steamship Co. was launched at the end of August. Twin 1,100 i.h.p. B. & W. Diesel-engines are being installed. Her length is 367 ft. by 51 ft. breadth. During the launch her rudder-post was damaged. After the repair she will be towed to the Burmeister & Wain plant, and have her Diesel-engine installed. A government loan has been granted towards her construction.

RECENTLY READ PAPERS

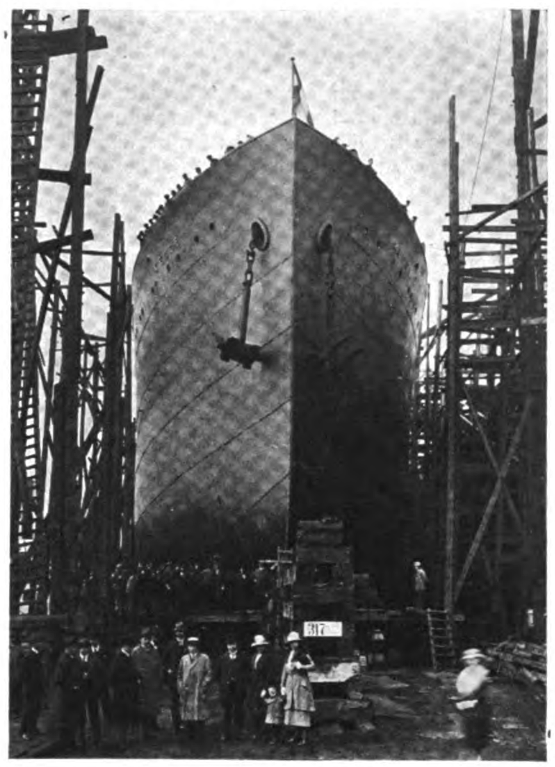
So many papers on Diesel engines and motorships—some of them of great interest—have recently been read in Great Britain before the various Societies that it is impossible for "Motorship" to reproduce extracts from them all. At the Olympia exhibition James Richardson read a paper entitled "Progress of Motorships." Before the Institute of Marine Engineers of England, F. G. Butt-Gow read a paper entitled, "The Open-Fronted Surface-Ignition Engine", and before the same Institute Andrew J. Brown read a paper called "The Reliablity of the Marine Diesel Engine in Service."

On October 18th, before the Institution of Engineers and Shipbuilders in Scotland, Engineer-Vice-Admiral Sir Geo. G. oodwin (Engineer-in-Chief of the British Navy) read a paper entitled "Developments in Modern Diesel Engines," while Sir Archibald Rennie read a treatise on the Still Oil Engine for Marine Propulsion," and David Bruce read a paper entitled "Some Factors Limiting the Power of Diesel Engines."

Before the Armstrong College Naval Architects Society, J. Tutin will read a paper on Motorships.

MOTOR-AUXILIARY SOLD TO IRELAND

The 360 tons motor-schooner "Venturer" has been sold by her London owners to R. Keron of Ireland. A 2-cycle Steywal oil-engine is installed.



Rotterdam-Lloyd's 6,500 tons d.w. motorship "KEDOE" just prior to the launch

WESTERN DIESEL ENGINE

In the list of Marine Diesel Engine Builders of the World in the "MOTORSHIP YEAR BOOK" (page 22) the Western Machinery Corp. thro a clerical error are quoted as building Tosi engines. This, of course, is incorrect as they are building the Western Diesel engine.

THE QUESTION OF AUXILIARY POWER

Professor Carl Hansen of the Polytechnic College, Copenhagen, Denmark, recently told the first convention of Scandinavian Shipowners at the meeting in Göteborg, Sweden, that he, together with Engineers Vogt & Petersen made some exhaustive studies of the operation of sailing-ships with and without power, using as a basis the Danish Sugar Works' auxiliary "Hvalen." The results, which were strongly in favor of auxiliary motor-power were given at length in his paper.

NEW SURFACE-IGNITION MARINE OIL-ENGINE

A new marine oil-engine of the surface-ignition type in powers from 3 b.h.p. to 30 b.h.p. has been produced by G. C. Ogle & Sons, Ltd. of Ripley, Derby, England. The trade-name of this engine is the Ogle.

FIFTY AMERICAN-ENGINED TUGS IN FRANCE

It is not generally known that some time ago 50 tugs were constructed of reinforced concrete in France and are now in operation on the Seine. Each of these vessels is propelled by a 200 b.h.p. motor operating a gas-generator from an anthracite gas-producer. The engines were built by the Wolverine Motor Works, of Bridgeport, Conn.

THE MARINE EXHIBITION.

Don't forget to go to the Marine Exhibition held by the Marine Equipment Association of America at the Central Mercantile Bldg., 45 West 18th St., N. Y. C., during the week of Nov. 14th. Many important concerns in the industry have very interesting exhibits. In connection with this exposition this issue of "Motorship" has been especially enlarged.

THIRTY DIESEL-ENGINES AVAILABLE

Ship and boat owners requiring immediate delivery of four-cycle type Diesel-engines will be interested to know that the New London Ship & Engine Company of Groton, Conn., have about 30 marine and auxiliary engines of 120 to 600 b.h.p. in stock, the prices of which will meet any domestic or foreign competition.

PUGET SOUND NAVIGATION CO'S NEW MOTORSHIP

The steamer "Whatcom" will be converted into a ferry-boat for operation on the Puget Sound run until next summer, when Puget Sound Navigation Company will build a Diesel-electric driven 18-knot steel motor ferry-boat. Bids will be asked from shipyards at both the Atlantic and Pacific Coasts.

ARDROSSAN YARD LAUNCHES MOTORSHIP "LOUISIANA."

Built to the order of the Det Forenede Dampskibs-Selskab (United Steamship Co.) of Copenhagen, the 10,000 tons deadweight motorship "Louisiana" was launched by the Ardrossan Dry Dock & Shipbuilding Co. at Ardrossan, Scotland, on October 4th. The vessel is of the closed shelter-deck type, her dimensions being: L.B.P., 497 ft.; breadth moulded, 55 ft.; depth moulded, 27 ft.; 9 in. to upper deck, 36 ft. 6 in. to shelter deck; deadweight, 10,300 tons on 28 ft. 4 in. draft; gross tonnage, 6,600 tons.

Her propelling machinery consists of a pair of 1,400 i.h.p. Burmeister & Wain Diesel-engines turning at 140 R.P.M. In the way of auxiliary machinery there are three Diesel-driven 60 KW sets.

MOTORSHIP CARRIES OIL FOR STEAMER

When the Hudson Bay Co.'s new motor-schooner "Lady Kindersley" left Vancouver, B. C., fully loaded on her maiden voyage to northern waters she carried, among other cargo, a supply of fuel-oil for the steamship "Casco." The "Lady Kindersley" also carried four motor launches.

Launch of Fred Olsen's 1,350 tons motorship "BALZAC" at the Odense Shipyard

BEACHING MOTORSHIP TO LOAD

Once every round voyage the West Australian Government's 5,800 tons d.w. motorship "Kangaroo" will be beached at Derby, West Australia, where the tide recedes to such a distance that she will be left high-and-dry two miles inland. Loading will be carried-out by means of horse-trucks.

BACK COPIES OF "MOTORSHIP"

We have been advised by Mr. B. D. Cullings, 1646 Lincoln Ave., Lakewood, Ohio, that he has a complete set of "Motorship" in good condition commencing with April, 1918, to date, which he is willing to dispose of. Recently we have had a number of inquiries for back copies, which we have been unable to supply.

HAWTHORN-WERKSPOOR DIESEL ENGINE

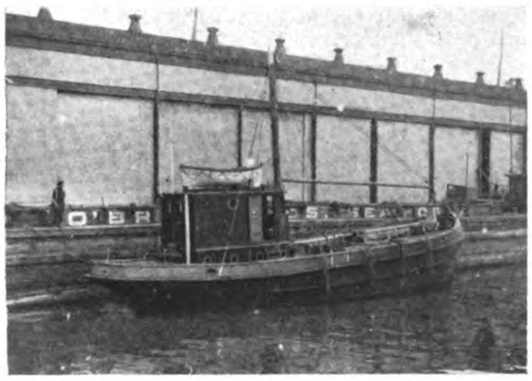
A pair of 1,400 i.h.p. Werkspoor Diesel engines are being built by R. & W. Hawthorn, Leslie & Co., St. Peters, Engine Works, Newcastle-on-Tyne, England. Larger sizes are being designed.

MOTORBOAT IN SODA LAKE

For operation on the Soda Lake of Mogodai, East Central Africa, by the Mogodai Soda Co., have had a 42 ft. stern-wheeler built in England. This little vessel is powered by two 30 b.h.p. Bolnes surface-ignition oil-engines.

"AURORA" AN ECONOMICAL HARBOR LIGHTER

While many steam-lighters in New York harbor are laid-up for lack of work during the present dull period, the new motor-lighter "Aurora" owned by the Marine Transportation Co. is steadily at work, operating at a profit on jobs which steam-lighters cannot touch because of higher operating costs. Her 100 h.p. Bolinders oil-engine drives a three-bladed 48 inch by 38 inch Trout propeller at 320 r. p. m., giving a speed of 9 knots at a fuel cost of 30 cents per hour, using fuel-oil. She can carry 35 tons in the hold and 40 tons on deck, with a 1½ ton motor-winch handling the derrick hoist. "Aurora" is 64 feet long, 18 feet breadth, 8 feet depth of hold, and draws 8 feet when loaded. A captain, engineer, and deck-hand constitute the crew. She was designed by J. Murray Watts and built by the Cambridge Manufacturing Co., Cambridge, Md., and placed in commission this past summer.



The harbor-lighter "AURORA" in service in New York.

Engine-room crew of the motorship "HAVELLAND"; she is described elsewhere in this issue. Left to right (standing) Herr Ebst, Asst. Engr.; Herr Brocks, Asst. Engr.; Herr Brinkner, Fourth Engr.; Herr Leps, Elec.; Herr Pless, Asst. Engr.; Herr Wittenburg, Asst. Engr. Left to right (sitting) Herr Trepken, Third Engr.; Herr Stege, Const. Engr. from Blohm & Voss, Hamburg, (not a member of the crew); Herr Hampe, Chief Engr.; Herr Noask, Second Engr.; Herr Cahnnbley, Third Engr.

TESTING THE U. S. NAVY'S NEW BIG SUBMARINE DIESEL-ENGINES

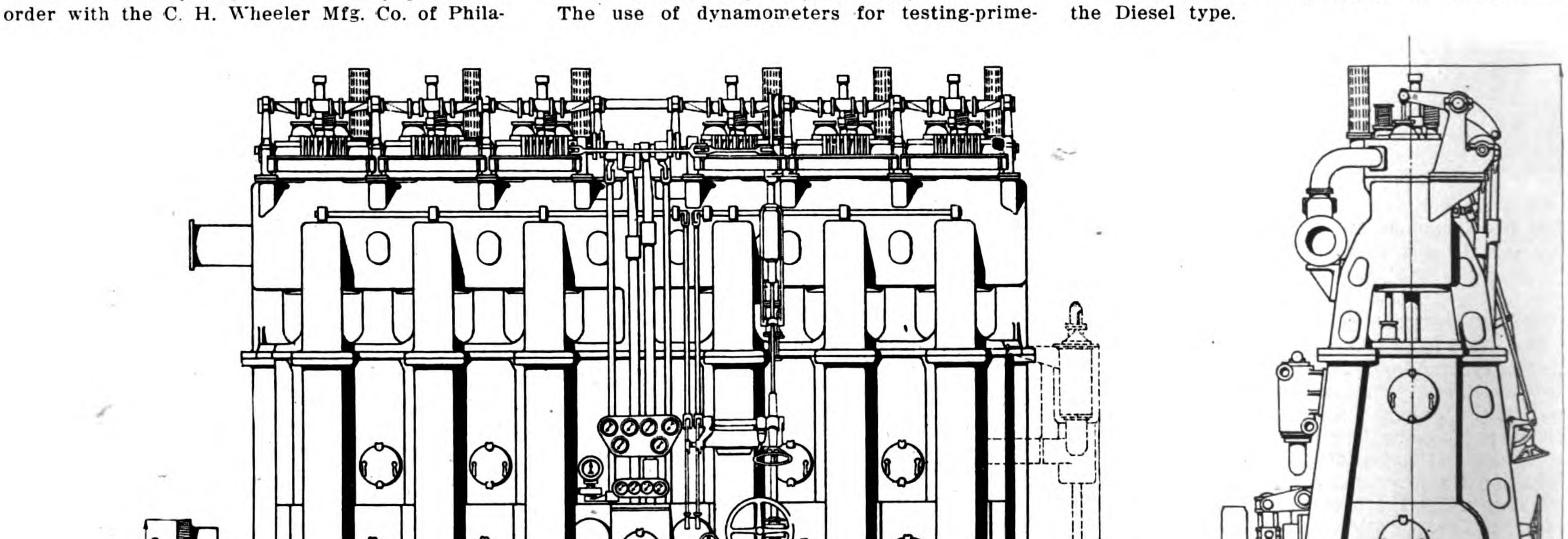
The U. S. Navy Dept. has recently placed an order with the C. H. Wheeler Mfg. Co. of Philadelphia, for a large size Froude dynamometer, which will be used in the first instance for testing the big Diesel-engines for submarines, which are now nearing completion at the New York Navy Yard. The Froude dynamometer in question will have a maximum rated capacity of 4,000 B. H. P. at speeds of from 310 to 500 R.P.M., and its operating range will be sufficiently wide to permit of testing as low as 50 B.H.P. at 200 R. P. M.

One of the most prominent features of the Froude dynamometer is its typically wide capacity range in both power and speed. Another feature particularly advantageous for marine-engine testing is its reversibility, whereby it may be employed for testing in both directions of rotation without uncoupling from the engine on test, the dynamometer automatically reversing its action when the engine is reversed. The manufacturers claim, and their claim is warranted by the operation of hundreds of installations, that the Froude Dynamometer gives the utmost of reliability and sentitiveness and at the same time combines these with ease of operation, either continuously or intermittently, and with practically no wear, since all friction is developed hydraulically.

The use of dynamometers for testing-prime-movers before their installation on shipboard is not nearly so universal in America as in Europe, but with the development of the oil-engine industry there will no doubt be a more general use of testing instruments in order to insure the most satisfactory results after installation. That a good beginning in this direction is being made is illustrated by the forthcoming installation at the New York Navy Yard of this new Dynamometer, and also by the present use of Froude dynamometers for Diesel-engine testing by such prominent Diesel-engine builders as the McIntosh & Seymour Corporation of Auburn, N. Y., Busch-Sulzer Bros. Diesel Engine Co. of St. Louis, Mo., Pacific Diesel Engine Co. of San Francisco, Cal., and the Dow Pump and Diesel Engine Co. of Alameda, Cal.

THIRTY-FIVE AUXILIARY SCHOONERS BUILDING BY KRUPPS

Orders for a total of 35 large oil-engined schooners and barks have been received by Krupps of Kiel, of which several have been placed in service. They vary from 115 tons to 5,200 tons deadweight, most of them being under 600 tons. Some have surface-ignition oil-engines, and others are of the Diesel type.



General arrangement of the new 950 shaft h.p. Deutsche Werke (Kiel) Diesel marine engine described on page 875 of this issue.

MOTORSHIP "BALCATTA" SOLD TO FRANCE

The wooden motorship "Balcatta" fitted with McIntosh & Seymour Diesel engines has been sold to French owners.

SAYS A BIG BRITISH SHIPBUILDER

"The opinion of those best qualified to judge is that the reciprocating steam-engine will be gradually replaced by the internal-combustion motor, ultimately leading to a new type of ship. Other builders and engineers are of the same opinion and have expended hundreds of thousands of pounds on perfecting the various types of engines."—*Sir Glynn Hamilton West, Chairman of Sir Wm. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, at the annual meeting of Stockholders.*

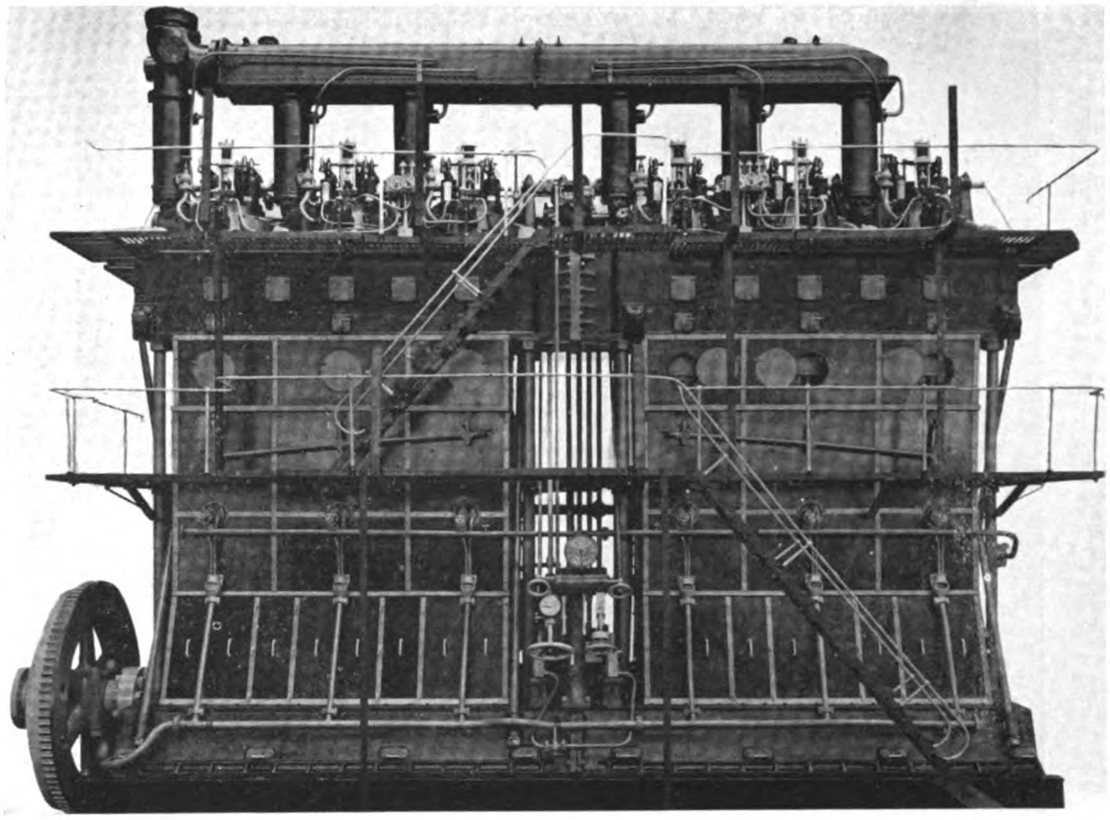
WHILE AMERICA SLEEPS!

In our last issue an unusual number of new motorships were described or illustrated, of which ten had just completed trials and five just launched. Altogether there were 43 big motorships described as follows—

Launched	Trials Run	Under Construction
1 Danish	1 American	10 British
2 Norwegian	2 Danish	1 Swedish
1 Dutch	2 Italian	1 Dutch
1 British	2 Swedish	1 Danish
	1 Spanish	2 Norwegian
5	1 Norwegian	10 German
	1 German	
	10	25

Newly Ordered	Projected
1 American	1 British
1 British	
2	

The 25 vessels under construction does not mean that these are all the motorships now building, but only refers to the particular craft that happened to be mentioned in our September issue, about which little information was previously available. It gives, however, an idea of the increasing adoption of the Diesel engine abroad.



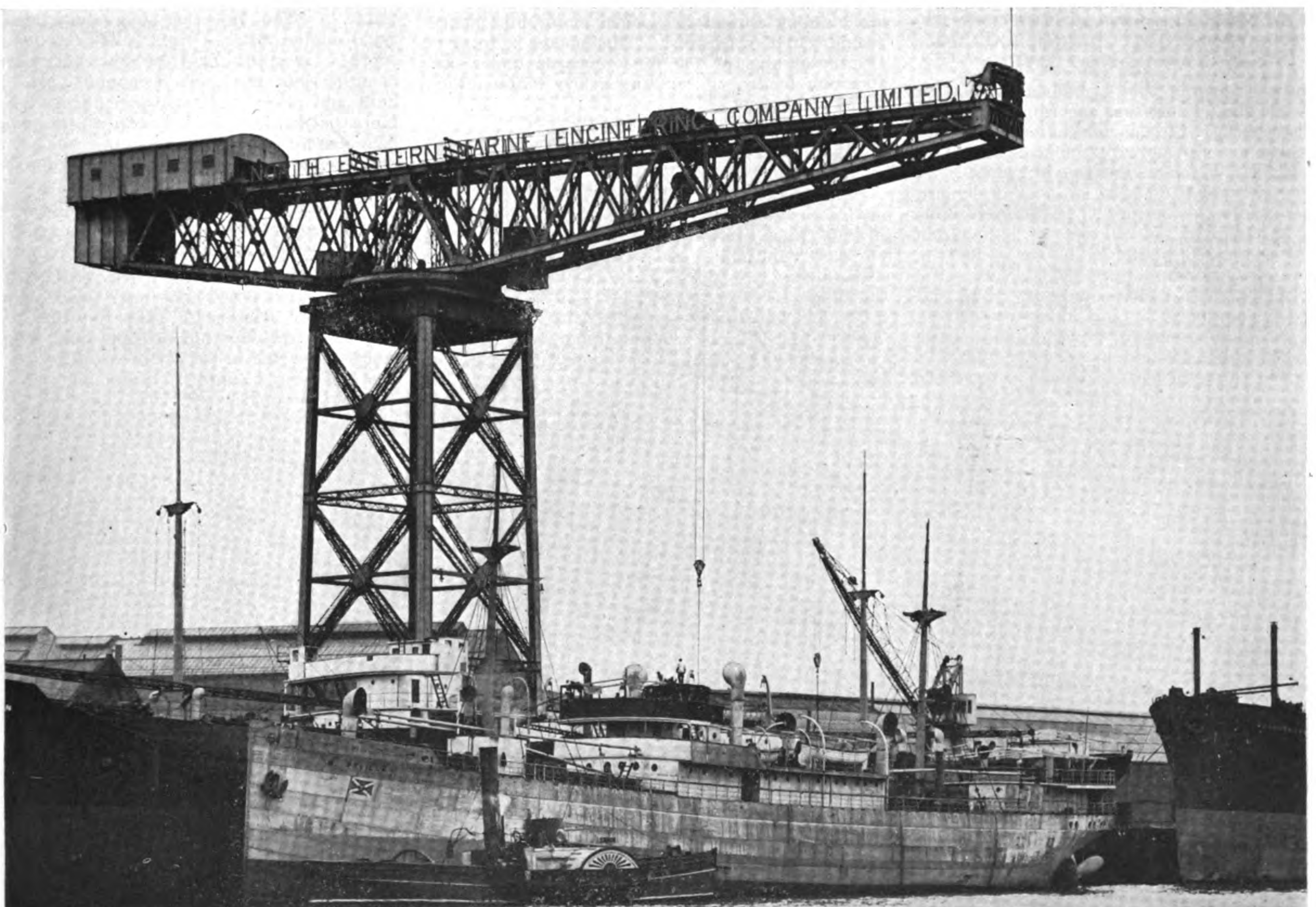
The 1,500 I.H.P. North Eastern-Werkspoor Diesel marine engine of the new motorship "SEVILLA."

CONCRETE MOTORSHIP SOLD TO FRANCE

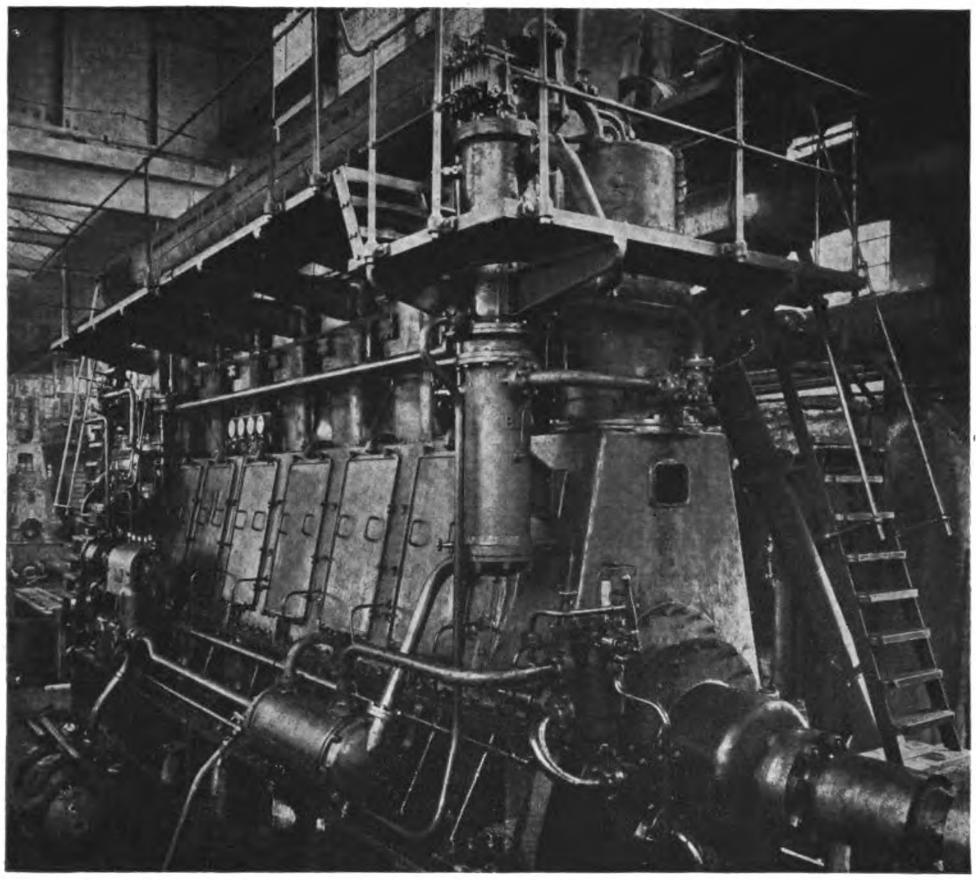
The 505 tons gross concrete oil-engined motorship "Prim," built in Norway last year, has been sold to I. M. Allum, shipowner, Boulogne-sur Mere, France, for Kr. 75,000.

OUR REGISTRY OF MOTORSHIP ENGINEERS

John E. Hough, 131 Lincoln St., Amherst, Ohio, has Chief's unlimited license for internal-combustion and electric drive, also a 1st Assistant unlimited for steam.



Single-screw motorship "SEVILLA fitting-out at the yard of the North Eastern Marine Engineering Co., Wallsend-on-Tyne, England, who built her 1,500 I.H.P. Werkspoor Diesel-engine under license. Her owner is Otto Thoresen of Christiana.



The new six-cylinder 900 shaft h.p. trunk-piston type Burmeister & Wain Diesel marine-engine. Drawings of a ship in which two of these motors are installed are given on another page. Owing to great pressure on space we are obliged to hold over a description of the engine and additional pictures until next month.

NEW BOOK ON FUEL OILS

The Economical Utilization of Liquid Fuel. By Carl A. Norman, Professor of Machine Design, The Ohio State University. Published as Engineering Experiment Station Bulletin No. 19 by the Ohio State University, Columbus, Ohio. In this 206 page 6 by 9 Bulletin, the author in addition to the recording the results of his own experiments has drawn on every conceivable source of data and compiled a valuable addition to literature on liquid-fuel, brought right up to the year 1921. Oil is a subject which, not only because of its increased use in various forms by thousands, but because of its present importance in world politics holds an important place in the thought of those associated with its production and use. Prof. Norman's bulletin reviews the liquid-fuel situation in the United States in the following phases:

(1) Available resources; (2) main reasons for the shortages in domestic supply of petroleum products which have occurred; (3) a study of the substitutes which have been proposed for petroleum products; (4) possibilities for relieving shortages by economy in production and use of petroleum and development of substitutes.

Part I, The Oil-Fuel Situation, discusses oil resources and consumption, the various forms of oil fuel and their use on land and sea and the steps which have been taken to develop substitutes in the form of alcohol from coal, farm and waste products, colloidal fuel, shale oil, etc.

Part II. is a technical discussion of the chemical nature, combustion and heat value of fuel, steam and internal-combustion engines being impartially compared from an engineering standpoint as regards the economical production of power for automotive purposes both on ship and shore. Two conclusions reached by the author are worthy of quotation.—"The fuel utilization obtained by the steam has inherent limitations because of the heat spent in evaporating the water." "The injection (solid-injection Diesel-type) engine in large sizes is at present a perfect success for marine and for stationary service; it is at present the most economical prime mover built and meets the requirements of the present fuel situation in that (1) it can utilize even cheap, heavy, non-volatile fuel, such as crude-oil, residue, and even coal tar, and (2) its high fuel-economy is well maintained at reduced load."

Part III. is a number of scientific articles on combustion engine processes.

105 STEEL MOTORSHIPS AGGREGATING 229,325 GROSS-TONS NOW BUILDING, EXCLUDING GERMANY, SAYS LLOYDS

American shipyards that are closing-down for lack of work should note that according to Lloyd's Register's report for the quarter ending September 30 last, there are now actually under construction no fewer than 105 steel motorships of 229,325 total gross-tonnage (about 385,795 deadweight tons), excluding the fleet of 30 large Diesel-driven ships building in Germany. Of these, 49 aggregating 229,325 gross-tons are building in Great Britain. Perhaps it is saying "we told you so," but the force of the fulfillment of our forecasts is now being felt. Incidentally, another British yard exclusively building steamers has had to shut-down, but neighboring yards lately secured Diesel-ship orders.

In addition to the above steel motorships there are building abroad 29 wooden motorships aggregating 23,146 gross-tons. This makes a total of 164 motorships of 100 tons upwards under construction to-day, aggregating nearly half-a-million deadweight tons.

AMERICAN ENGINEERING CO. AT MARINE SHOW

Because the Naval Architects' Society will specialize on electrical propulsion and electrical auxiliaries this firm confine their exhibit at the Marine Exhibition (Central Mercantile Bldg., New York, week of Nov. 14) to electrical deck and deck machinery. Their space is at booths 81 and 82. P. E. Kniebel, marine sales manager, will be in charge. D. C. Spencer (Advt. Mgr.), E. B. Bryant, C. V. Koons, F. W. Kay, R. C. Lamond and H. Buckholtz.

CAMILLO EITZEN LINE WOUND-UP

Because two 6,500 tons d.w. Diesel motorships ordered for delivery in 1918 and 1920 were not delivered, the Camillo Eitzen Line, Christiana, Norway, started in 1915 with Kr. 4,000,000 capital, has just been voluntarily wound-up.

East Asiatic Co.'s new motorship "JAVA." She is propelled by Burmeister & Wain Diesel engines. After completing her trials she started on her maiden voyage to the Far East without re-entering harbor.

FIRST BOLINDER-ENGINED NEW ENGLAND FISHING VESSEL

Recently trials were run at Gloucester, Mass., of the fishing schooner "Pioneer," which is the first New England fishing vessel to be fitted with the new type of Bolinder oil-engines. This vessel was built in 1892, but last year was purchased by O'Hara Bros. Inc., of the Boston fish Pier, who changed the vessel's name from "Edward A. Rich" to "Pioneer." The work of installing the machinery was carried out by Burnham Brothers Marine Railways Company, under the supervision of engineers from the Boston office of the Bolinder Engine Company.

She is a vessel of 83 tons gross with a length of 81 ft., by 23 ft. breadth and 9 ft., 2 in. depth. The oil-engine is of 70 b. h. p. and drives a Columbian bronze propeller of 44 in. diameter and 30 in. pitch at 350 R.P.M. On trials a speed of 7 knots against the tide and winds was attained, and a speed of 8-knots on the return trip. It is interesting to record that several more installations of Bolinder engines in fishing-boats will soon be carried-out, including that of the 100 b.h.p. engine of the schooner "Blanche Ring" now being completed at Rockport, Mass., for Captain Herbert W. Nickerson, of Malden, Mass.

Recently John F. O'Hara, president of the owners of this fishing-schooner wrote to the engine-builders that the vessel had just returned from a four weeks' fishing trip and that the engine was run for 299 hours without a hitch, consuming only five gallons of Standard Oil Company's crude-oil per hour, and less than a quarter-of-a-gallon of lubricating-oil. The vessel attained a speed of 7½ knots with ease when driving the 30 in. x 44 in. wheel. He is convinced that the engine has made good all that is claimed for it.

DIESEL-ELECTRIC DRIVE FOR NAVAL YACHT

Two 6-cylinder Winton Diesel-engines, 7½ in. bore by 11 in. stroke, coupled to two 90-K. W. direct-connected generators are to be installed as propelling power in a new yacht to be built for Mr. G. A. Hancock, the well-known oil magnate of Los Angeles. The main driving electric-motor will be of 125 h. p. turning at 275 R. P. M. Heating and lighting will be by electricity throughout.

AUXILIARY DIESEL-ENGINE OF THE "MAJESTIC"

As with all White Star liners, the new mammoth ship "Majestic" now completing in Germany, has an independent 80 b.h.p. Diesel-electric generating-set installed 19 feet above the bulkhead deck for emergency purposes, including handling the boat-lowering machinery, the wireless and the navigating and signalling instruments. It also feeds 800 lamps distributed all over the ship.

MORE GERMAN MOTORSHIPS BUILDING

Two full-powered motorships, a 1,000 tons canal motor-barge, and a 200 tons d.w.c. auxiliary-schooner are building at the Schulte & Bruns Werft, Emden, Germany. The latter vessel was recently launched.

A 500 tons d.w.c. motor-schooner was launched on July 30th, at the D. W. Kremer Sohn shipyard, Elmshorn, to the order of the Rederi Rheinland of Duisburg, Ruhrort. A sister oil-engined ship was launched on Aug. 8th, at the same yard.

SUB-CHASER NOW SALMON CARRIER

"Gloria West," ex Sub-chaser No. 291, is now engaged in carrying salmon on the Pacific Coast in connection with the curing station of H. T. West of Seattle, at Tofino, Clayoquot. She is one of the 110-ft. class boats, and now has two holds, one 30 ft. and the other 20 ft., carrying a total of 70 tons of fish. Cargo is worked by an one-ton Western Electric hoist that derives its power from a two-cylinder, four-cycle, Eastern-Standard gasolene-engine driven generating set of 4½ K.W. The main power plant now consists of twin 220 b.h.p. Eastern-Standard gasolene engines. A total of 2,700 gallons of fuel is carried.

TRANSFER OF MOTORSHIP "PINTHIS"

The American motorship "Pinthis," built in 1919 for the Sugar Products Co. of New York, has been transferred to the Cuban flag. She is of 1,750 tons d.w.c. and is propelled by a four-cylder 500 b.h.p. Bolinder oil-engine.

Bolinder-engined fishing-schooner "PIONEER"

NEW MOTORSHIP'S CARGO HANDLING CAPACITY

Four of the big 40 tons Pirrie-McFarland electric-winches illustrated in our issue of November, 1920, are installed on the new British motorship, "Loch Katrine" of the Royal Mail Steam Packet Company. Ten smaller electric-winches are also fitted. The big winches each will lift three tons at 310 ft. per minute.

ANOTHER ITALIAN-ENGINED MOTORSHIP

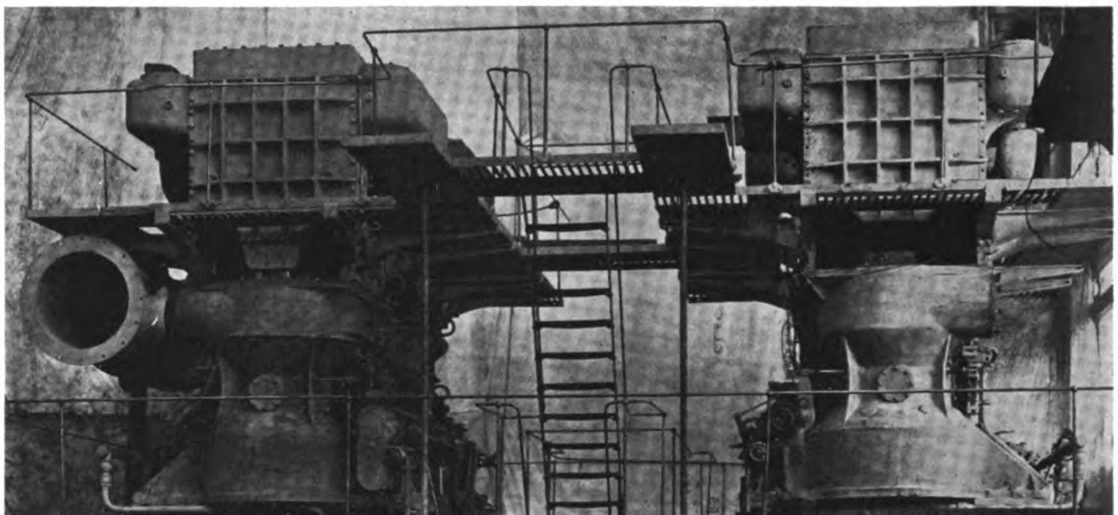
Now under construction at Trieste is a 9,000 tons d.w. motorship in which twin 1,200 shaft h.p. Tosi Diesel-engines are being installed.

TRIALS OF THE MOTORSHIP "ODIN"

Trials of the German cargo motorship "Odin," converted from a warship, were recently carried out by the Deutschen Werke A/G of Rustringen. She is owned by the Reederi Arnold Bernstein of Hamburg, and is propelled by twin six-cylinder 400 b.h.p. Diesel-engines. Length 260 ft., breadth 51 ft., depth 14 ft., 9 in. She loaded engines for "Ruona" for her maiden voyage.

LAUNCH OF MOTORSHIP "BANGOLI I"

On Sept. 22nd the 9,000 tons deadweight motorship "Bangoli I" was launched at the Ilva Shipyard, Italy.



A pair of 1,000 shaft h.p. Cammellaird-Fullagar opposed-piston type Diesel marine-engines. The motorship "MALIA" which has twin 500 shaft h.p. sets described and illustrated on page 876 of this issue.